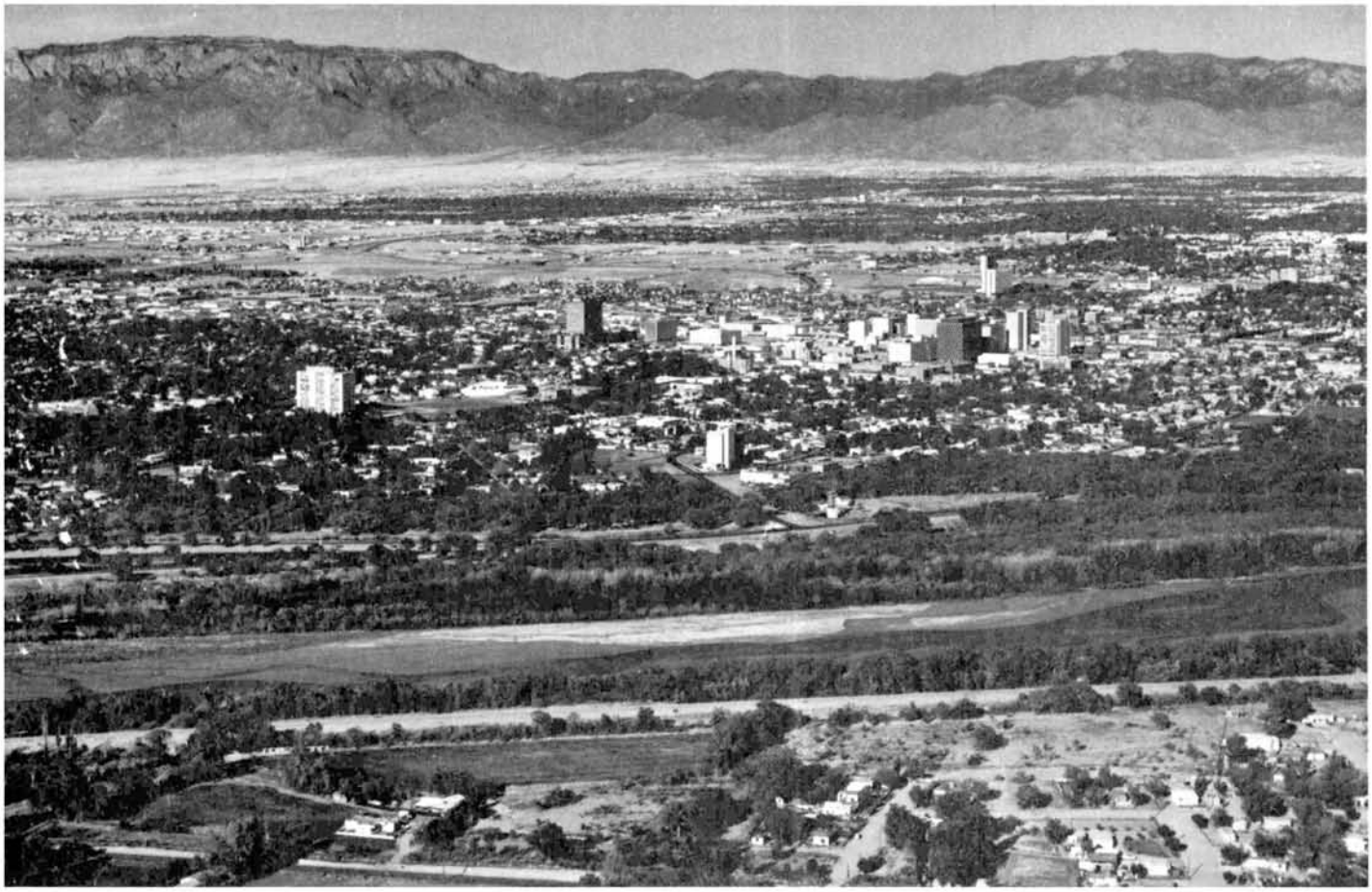
SOIL SURVEY OF

Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico



United States Department of Agriculture
Soil Conservation Service and Forest Service
and
United States Department of the Interior
Bureau of Indian Affairs and Bureau of Land Management
in cooperation with
New Mexico Agricultural Experiment Station

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in the period 1965–72. Soil names and descriptions were approved in 1973. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1973. This survey was made cooperatively by the United States Department of Agriculture, Soil Conservation Service and Forest Service, the United States Department of the Interior, Bureau of Indian Affairs and Bureau of Land Management, and the New Mexico Agricultural Experiment Station. It is part of the technical assistance furnished to the Central Rio Grande Natural Resource District, the Sandia Ranger District, the Southern Pueblos Agency, the Crownpoint Agency, and the Middle Rio Grande Council of Governments of New Mexico.

Soil maps in this survey may be copied without permission, but any enlargement of these maps could cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms, ranches, and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Bernalillo County and Parts of Sandoval and Valencia Counties are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the area in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described, the page for the capability unit, and the timber suitability groups and native plant communities to which some of the soils have been assigned.

Individual colored maps showing the suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the descriptions of the soils, the capability units, the native plant communities, and the timber suitability groups.

Foresters and others can refer to the section "Timber," where some of the soils of the area are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Wildlife."

Ranchers and suburban dwellers can find, under "Native Plant Communities," groupings of the soils according to their suitability for range, and also the names of many of the plants that grow on the soils in each native plant community.

Community planners and others can read about soil properties that affect the choice of sites for dwellings and industrial buildings and for recreational areas in the sections "Recreation" and "Engineering."

Engineers and builders can find, under "Engineering," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in the survey area may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the area in the section "Environmental Features that Affect Soil Use."

Cover: **Landscape around Albuquerque, New Mexico. The Rio Grande is in the foreground and the Sandia Mountains in the background.**

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SOIL SURVEY OF BERNALILLO COUNTY AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE AND FOREST SERVICE, AND UNITED STATES DEPARTMENT OF THE INTERIOR, BUREAU OF INDIAN AFFAIRS AND BUREAU OF LAND MANAGEMENT, IN COOPERATION WITH THE NEW MEXICO AGRICULTURAL EXPERIMENT STATION

THIS SOIL SURVEY AREA covers Bernalillo County and the adjoining parts of the Cibola National Forest in Sandoval County and the Canoncito Navajo Reservation in Sandoval and Valencia Counties. Albuquerque, the county seat of Bernalillo County and the largest city in New Mexico, is southwest of Santa Fe, the State capital. Distances by air from Albuquerque to principal cities in the State are shown in figure 1.

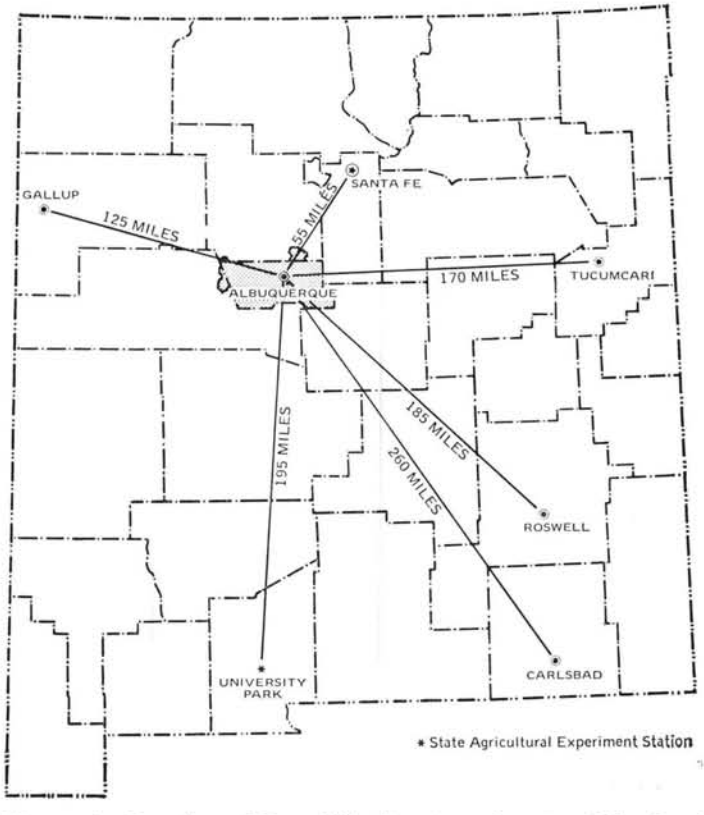

Figure 1.—**Location of Bernalillo County and parts of Sandoval and Valencia Counties in New Mexico.**

The survey area is about 25 miles long and 60 miles wide. It is about 1,236 square miles, or 790,447 acres. The Cibola National Forest makes up about 116,000 acres in the east-central part of the area, and Indian reservations, including the Canoncito Reservation and parts of the Isleta, Laguna, and Sandia Reservations, make up about 227,000 acres in the southern, western, and northern parts. The population of the survey area is about 350,000.

The Rio Grande divides the survey area from north to south about at the center. The Sandia, Manzanita, and Manzano Mountains form the east-central part of the survey area, and the Rio Puerco splits the western part. High sandstone buttes and mesas form the far western edge. The local names used to locate various parts of the area are shown in figure 2.

Plate Mesa, in the western part, has an elevation of 6,597 feet, which drops to about 4,850 feet in the Rio Grande Valley. Sandia Crest, in the Sandia Mountains, has an elevation of 10,678 feet.

Alfalfa and tame pasture are the main crops. Natural vegetation ranges from desert grasses and shrubs to mixed conifer trees. Annual precipitation ranges from 7 inches in the Rio Grande Valley to 22 inches in the mountains.

On about 75 percent of the acreage on the East and West Mesas, the soils have few limitations for community development, but in places those on the West Mesa are underlain by basalt bedrock, which restricts such development. Local flooding is a hazard along normally dry drainageways.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are located, and how they can be used. They went into the area knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes; the size and speed of streams; the kinds of native plants or crops; the kinds of

[1] Part of the fieldwork was done by THOMAS E. CALHOUN, JACK C. CHUGG, DAVID K. GOEGLEIN, WARREN G. HENDERSON, and DEAN L. STONEMAN, Soil Conservation Service, and by JOHN GLASS, WILLIAM KLOPSTECK, JOE E. LOFTIES, HARRIS E. SAMPSON, and BILLIE D. SMITH, Bureau of Indian Affairs.

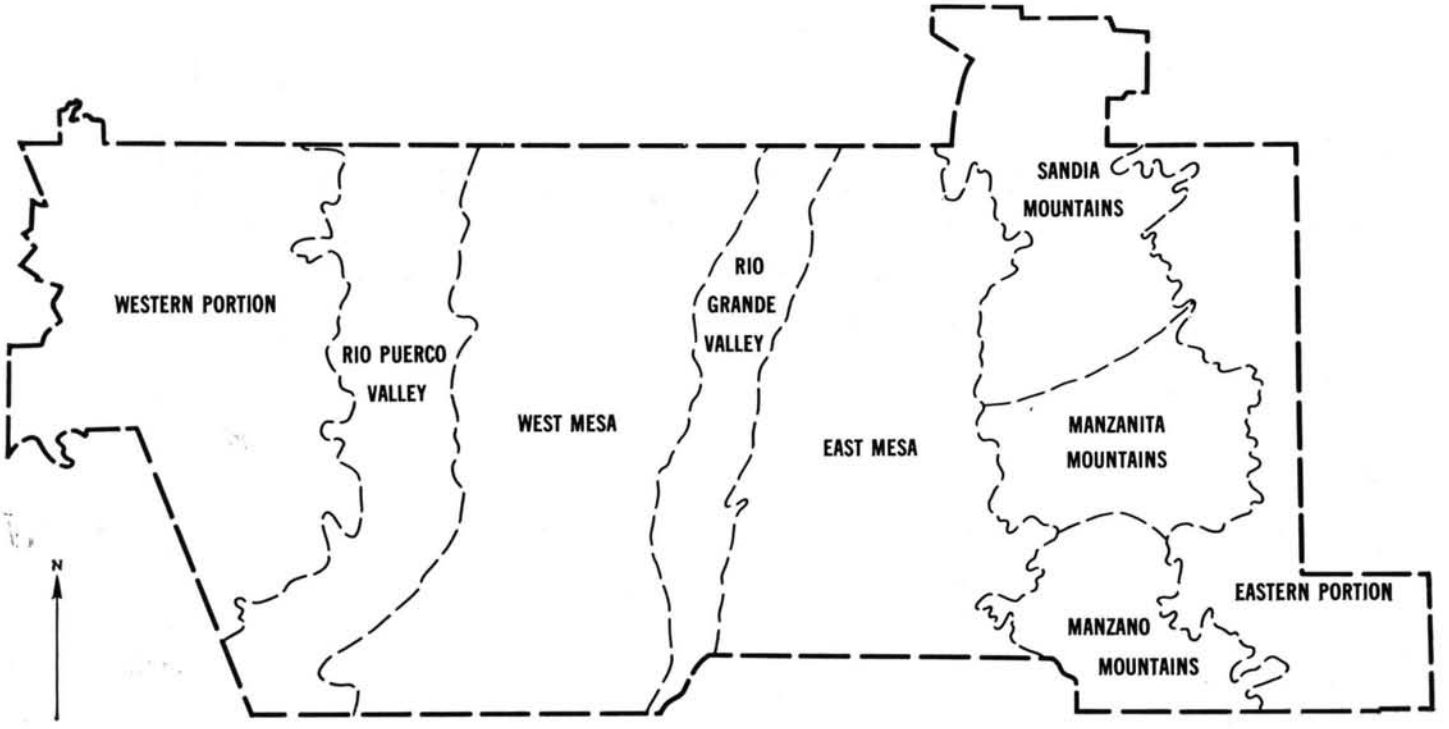

Figure 2.—**Major local names used in the survey area for general location.**

rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles. with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in this survey. The *soil variant* is also used.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, the major horizons of all the soils of one series are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feaure near the place where a soil of that series was first observed and mapped. Embudo and Tijeras, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

A soil variant has properties sufficiently different from those of other known soils to suggest establishing a new series, but is of such limited known extent that creation of a new series is not justified. The Agua variant is an example.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Gila clay loam is one of several phases in the Gila series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series or of different phases within one series. Three such kinds of mapping units are shown on the soil map of this survey area: soil complexes, soil associations, and undifferentiated groups.

A soil complex consists of areas of two or more soils so intermingled or so small that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. An example is Akela-Rock outcrop complex, 1 to 9 percent slopes.

A soil association is made up of adjacent soils that occur as areas large enough to be shown individually on

the soil map but that are shown as one unit because the time and effort of delineating them separately cannot be justified. There is a considerable degree of uniformity in pattern and relative extent of the dominant soils, but the soils can differ greatly one from another. The name of an association consists of the names of the dominant soils, joined by a hyphen. An example is Madurez-Wink association, undulating.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map can be made up of only one of the dominant soils or of two or more. If there are two or more dominant series represented in the group, the name of the group ordinarily consists of the names of the dominant soils, joined by "and." An example is Silver and Witt soils, 2 to 5 percent slopes.

Most surveys include areas where the soil material is so rocky, so shallow, so severely eroded, or so variable that it cannot be classified by soil series. These areas are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. An example is Badland.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing medium for native and cultivated plants and as material for structures, foundations for structures, or covering for structures. They then relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this failure to slow permeability or a high water table. They see that streets, road pavements, and foundations for houses crack on a given kind of soil, and they relate this failure to a high shrink-swell potential, Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of a soil for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, and then adjust the groups according to the results of their study and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in the survey area. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association can occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in an area, who want to compare different parts of an area, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area or in planning engineering works, recreational facilities, or community developments. It is not a suitable map for planning the management of a farm or field or for selecting the exact location of a road, building, or similar structure because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

For broad interpretative purposes, the soil associations in this survey have been grouped into five general kinds of landscapes. These general groups and the 13 soil associations are described on the following pages. The terms for texture used in the titles of several of the associations apply to the texture of the surface layer.

Deep Soils on Flood Plains and Dissected Terraces

Soil associations 1, 2, and 3 are deep, level to steep, well drained to excessively drained loamy, sandy, and gravelly soils on flood plains, terraces, and alluvial fans in and along the Rio Grande, Rio Puerco, and Tijeras Arroyo Valleys. The soils formed in alluvium. The native vegetation is principally short and mid grasses and some shrubs. Elevations range from 4,900 to 6,000 feet.

1. Gila-Vinton-Brazito association

Level or nearly level, well drained loamy soils mainly on the flood plain along the Rio Grande

This association is on the level or nearly level flood plains and low terraces of the Rio Grande and Tijeras Arroyo Valleys. The native vegetation is mainly mid and short grasses, fourwing saltbush, and sand sagebrush. Elevations range from 4,900 to 6,000 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 165 to 185 days.

This association makes up about 7 percent of the survey area. It is about 33 percent Gila soils, 25 percent Vinton soils, 13 percent Brazito soils, and 29 percent Agua, Glendale, Anapra, and Armijo soils and the frequently flooded Torrifluvents.

Gila soils typically have a surface layer of calcareous brown loam. This layer is underlain by stratified very fine sandy loam and sandy loam. Beneath this is pale brown sand.

Vinton soils typically have a surface layer of brown sandy loam. The underlying layers are pale brown and pinkish gray loamy sand and pinkish gray very fine sand.

Brazito soils typically have a surface layer of light reddish brown and reddish brown silty clay loam. The underlying layer is light brown coarse sand.

The soils in this association are used for irrigated pasture and crops and for community development.

Some small areas of wet, saline- and alkali-affected soils and soils that have a moderate or high shrink-swell potential are likely to limit engineering uses. Local areas need protection from flooding.

2. Bluepoint-Kokan association

Nearly level to steep, somewhat excessively drained or excessively drained sandy and gravelly soils on dissected terraces and alluvial fans

This association is mainly on the nearly level to steep dissected terraces east and west of the Rio Grande and Rio Puerco Valleys. The native vegetation is mainly mid and short grasses and broom snakeweed. Elevations range from about 4,900 to 6,000 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 165 to 195 days.

This association makes up 20 percent of the survey area. It is about 65 percent Bluepoint soils, 28 percent Kokan soils, and 7 percent Wink and Vinton soils, Rock outcrop, and Cut and fill land.

Bluepoint soils typically are pale brown loamy fine sand and loamy sand and light yellowish brown loamy sand. They formed in sandy alluvium partly modified by wind. These nearly level to rolling soils are mainly on broad, convex alluvial fans.

Kokan soils typically are very pale brown gravelly and very gravelly sand. They formed in old alluvial sand and gravel of mixed sources. These rolling to steep soils are on dissected terraces.

The soils in this association are used for range, wildlife habitat, watershed, and community development. Wildlife is mainly scaled quail and mourning dove. Kokan soils are a potential source of sand and gravel. The hazard of water erosion is moderate or severe. Sediment on this association is a major limitation. Local tracts are a source of Indian artifacts.

3. Hantz-Gila association

Level or nearly level, well drained loamy soils mainly on the flood plain along the Rio Puerco

This association is on the level or nearly level flood plain along the Rio Puerco and its tributaries. The major soils formed in alluvium derived primarily from shale. The native vegetation is mainly mid and short grasses and fourwing saltbush. Elevations range from about 5,000 to 6,000 feet. The mean annual precipitation is 7 to 14 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 165 to 185 days.

This association makes up about 3 percent of the survey area. It is about 62 percent Hantz soils, 35 percent Gila soils, and 3 percent Bluepoint and Penistaja soils on terraces and uplands.

Hantz soils typically have a surface layer of pale brown silty clay loam. This layer is underlain by light gray and light brownish gray silty clay. These soils are in swales and concave areas.

Gila soils typically have a surface layer of brown silty clay loam. This layer is underlain by stratified brown and light yellowish brown very fine sandy loam and sandy loam. These soils are in the slightly higher areas.

The soils in this association are used for range and wildlife habitat. Saline and alkali conditions are common.

Deep Soils on Alluvial Fans, Mesas, and Piedmonts

Soil associations 4, 5, and 6 are deep, level to moderately steep, well drained loamy and gravelly soils on the East and West Mesas. The soils formed in old, unconsolidated, mixed sandy and gravelly alluvium. The native vegetation is shrubs and short, mid, and tall grasses. Elevations range from 4,800 to 6,500 feet.

4. Madurez-Wink association

Level to moderately sloping, well drained loamy soils on piedmonts

This association is on the level to moderately sloping East and West Mesas. The major soils formed in old unconsolidated alluvium modified by wind. The native vegetation is mainly mid and short grasses and shrubs. Elevations range from 4,900 to 6,000 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 170 to 195 days.

This association makes up 16 percent of the survey area. It is about 53 percent Madurez soils, 27 percent Wink soils, and 20 percent Pajarito, Latene, and Embudo soils and Cut and fill land.

Madurez soils typically have a surface layer of brown fine sandy loam, a subsoil of brown sandy clay loam and light brown fine sandy loam, and a substratum of pink, pinkish gray, and light brown sandy loam. They are in slightly concave upland areas.

Wink soils typically have a surface layer of brown fine sandy loam and sandy loam, a subsoil of light brown sandy loam, and a substratum of pinkish gray and pinkish white sandy loam that is high in lime content. They are in slightly convex upland areas.

The soils in this association are used for range, watershed, wildlife habitat, and community development. Wildlife is mainly scaled quail, mourning dove, and antelope. Several tracts have been subdivided.

5. Tijeras-Embudo association

Level to moderately sloping, well drained loamy and gravelly soils on alluvial fans

This association is on the level to moderately sloping western foot slopes of the Sandia and Manzano Mountains. The native vegetation is mainly mid and short grasses, cholla cactus, and small soapweed. Elevations range from 4,800 to 6,500 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 170 to 195 days.

This association makes up about 9 percent of the survey area. It is about 38 percent Tijeras soils, 30 percent Embudo soils, and 32 percent Tome, Tesajo, Millett, Wink, Madurez, and Bluepoint soils.

Tijeras soils typically have a surface layer of brown gravelly fine sandy loam, a subsoil of brown sandy clay loam, and a substratum of pale brown, calcareous very gravelly loamy sand and gravelly sandy loam. These nearly level to moderately sloping soils are mainly on the upper parts of old alluvial fans.

Embudo soils typically have a surface layer of brown gravelly fine sandy loam. This layer is underlain by

brown and light brownish gray gravelly sandy loam and pale brown gravelly loamy coarse sand. These level to gently sloping soils are mainly in depressional areas or on the lower parts of alluvial fans.

The soils in this association are used for community development, range, and wildlife habitat. Several tracts have been subdivided.

6. *Latene-Nickel association*

Nearly level to moderately steep, well drained loamy and gravelly soils on mesas and fans

This association is on nearly level to moderately steep mesas and fans mainly in the south-central part of the survey area. The native vegetation is broom snakeweed and mid and short grasses. Elevations range from 5,000 to 6,000 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 170 to 195 days.

This association makes up about 1 percent of the survey area. It is about 65 percent Latene soils, 30 percent Nickel soils, and 5 percent Wink and Madurez soils.

Latene soils typically have a surface layer of brown sandy loam. This layer is underlain by pale brown sandy loam and white gravelly sandy loam. These nearly level to gently sloping soils are on mesas.

Nickel soils typically have a surface layer of brown gravelly fine sandy loam. This layer is underlain by light brown gravelly loam, pinkish gray very gravelly loam, light brown very gravelly loamy sand, and light brown very gravelly sandy loam. These moderately sloping to moderately steep soils are on fans.

The soils in this association are used for range, wildlife habitat, watershed, and community development.

Moderately Deep or Shallow Soils on Basalt Flows

Soil association 7 is shallow or moderately deep, well drained loamy and cobbly soils on the West Mesa. The soils formed in material overlying basalt bedrock. The native vegetation is shrubs and short and mid grasses. Elevations range from 5,000 to 6,000 feet.

7. *Alemeda-Akela association*

Level to gently rolling, well drained loamy and cobbly soils

This association is on level to gently rolling basalt flows west of the Rio Grande Valley. The native vegetation is mid and short grasses, shrubs, and annuals. Elevations range from 5,000 to 6,000 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is about 58° to 60° F, and the frost-free season is 170 to 195 days.

This association makes up about 2 percent of the survey area. It is about 55 percent Alemeda soils, 13 percent Akela soils, 17 percent Rock outcrop, and 15 percent Bluepoint, Wink, and Madurez soils.

Alemeda soils typically have a surface layer of light yellowish brown sandy loam, a subsoil of light yellowish brown loam and pale brown gravelly sandy loam, and a substratum of light gray very cobbly sandy loam underlain by basalt bedrock at a depth of 20 to 40 inches. They are level to undulating and are moderately deep.

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Akela soils typically have a surface layer of pale brown cobbly sandy loam. This layer is underlain by light gray very gravelly sandy loam that extends to fractured basalt at a depth of about 10 to 20 inches. They are gently undulating to gently rolling and are shallow.

The soils in this association are used for recreation, community development, watershed, wildlife habitat, and range. The moderate or shallow depth to bedrock and the high content of basalt cobbles and stones severely limit engineering uses. Some areas provide a potential source of basalt stone or volcanic cinders.

Very Shallow to Deep Soils on Uplands

Soil associations 8, 9, 10, and 11 are very shallow to deep, well drained loamy soils that formed in material weathered from sandstone, shale, or limestone. These soils are on uplands. The native vegetation is mid grasses, shrubs, oneseed juniper, and pinyon pine. Elevations range from 5,400 to 8,000 feet.

8. *Penistaja-Travessilla-Bond association*

Deep to very shallow, nearly level to strongly sloping, well drained loamy soils over sandstone

This association is in nearly level to strongly sloping areas in the northwest part of the survey area. The native vegetation is mid and short grasses and oneseed juniper. Elevations range from 5,400 to 8,000 feet. The mean annual precipitation is 10 to 16 inches, the mean annual air temperature is 50° to 54° F, and the frost-free season is 110 to 155 days.

This association makes up about 4 percent of the survey area. It is about 30 percent Penistaja soils; 28 percent Travessilla soils; 18 percent Bond soils; 15 percent Kim, Shingle, and Bluepoint soils and Badland; and 9 percent Rock outcrop.

Penistaja soils typically have a surface layer of brown fine sandy loam, a subsoil of strong brown and light brown sandy clay loam, and a substratum of light brown loamy fine sand that extends to a depth of 60 inches or more. They are nearly level to gently sloping and are deep to sandstone.

Travessilla soils typically have a surface layer of light yellowish brown fine sandy loam. This layer is underlain by pale brown sandy loam. Sandstone bedrock is at a depth of about 10 inches. Travessilla soils are nearly level to strongly sloping and are shallow or very shallow.

Bond soils typically have a surface layer of brown fine sandy loam and a subsoil of brown and strong brown sandy clay loam that is underlain by sandstone bedrock at a depth of about 18 inches. They are moderately sloping to strongly sloping and are shallow.

The soils in this association are used for range, wildlife habitat, and watershed. The shallow or very shallow depth to bedrock in Travessilla and Bond soils severely limits engineering uses.

9. *Penistaja-Otero association*

Deep, nearly level to moderately sloping, well drained loamy soils underlain in places by sandstone

This association is on nearly level to moderately sloping uplands in the western part of the survey area. The major

soils formed in aeolian deposits underlain by sandstone and in old alluvium derived from sandstone on upland alluvial fans. The native vegetation is mid and short grasses. Elevations range from 5,400 to 7,000 feet. The mean annual precipitation is 10 to 14 inches, the mean annual air temperature is 52° to 55° F, and the frost-free season is 120 to 155 days.

This association makes up about 5 percent of the survey area. It is 65 percent Penistaja soils, 12 percent Otero soils, and 23 percent Travessilla and Silver soils, Badland, and Rock outcrop.

Penistaja soils typically have a surface layer of brown fine sandy loam, a subsoil of strong brown and light brown sandy clay loam, and a substratum of light brown loamy fine sand underlain by sandstone. They are nearly level to gently sloping.

Otero soils typically have a surface layer of yellowish brown fine sandy loam and a substratum of yellowish brown and brown fine sandy loam and loamy fine sand. These nearly level to moderately sloping soils are on alluvial fans.

The soils in this association are used mainly for range, wildlife habitat, and watershed.

10. Shingle-Kim association

Deep to very shallow, level to gently rolling, well drained loamy soils over shale and sandstone

This association is on level to gently rolling, broad, moderately incised valleys and associated uplands in the western part of the survey area. The major soils formed in residuum derived from soft shale and in alluvium weathered from interbedded shale and sandstone. The native vegetation is mid and short grasses. Elevations range from about 5,500 to 6,000 feet. The mean annual precipitation is 10 to 14 inches, the mean annual air temperature is 53° to 55° F, and the frost-free season is 120 to 155 days.

This association makes up 3 percent of the survey area. It is about 50 percent Shingle soils, 25 percent Kim soils, and 25 percent Badland, Rock outcrop, and Penistaja and Hantz soils.

Shingle soils typically have a surface layer of light olive brown clay loam. This layer is underlain by light brownish gray silty clay loam. Shale and soft siltstone bedrock is at a depth of about 15 inches. These soils are shallow or very shallow over soft shale and are in convex areas.

Kim soils typically have a surface layer of light olive brown sandy loam. This layer is underlain to a depth of 60 inches or more by light yellowish brown loam. These soils are deep over interbedded shale and sandstone and are in concave areas.

The soils in this association are used for range, wildlife habitat, and watershed.

11. Silver-Witt-Laporte association

Deep to very shallow, level to moderately steep, well drained loamy soils underlain in places by limestone

This association is on level to moderately steep uplands in the eastern part of the survey area. The major soils formed in old alluvium, in sediments derived from mixed parent material, and in residuum weathered from limestone bedrock. The native vegetation is mid and short grasses, pinyon pine, and oneseed juniper. Elevations range from 6,400 to 7,500 feet. The mean annual precipitation is 10 to 16 inches, the mean annual air temperature is 47° to 55° F, and the frost-free season is 110 to 115 days.

This association makes up 10 percent of the survey area. It is 30 percent Silver soils, 24 percent Witt soils, 20 percent Laporte soils, and 26 percent Rock outcrop, Manzano soils, and Borolls.

Silver soils typically have a surface layer of brown very fine sandy loam, a subsoil of brown and light brown heavy silty clay loam and brown heavy silt loam, and a substratum of light brown heavy silt loam. They are deep and level to strongly sloping.

Witt soils typically have a surface layer of dark yellowish brown very fine sandy loam, a subsoil of reddish brown silty clay loam, and a substratum of pinkish white light silty clay loam. They are deep and nearly level to moderately sloping.

Laporte soils typically have a surface layer of dark grayish brown loam. This layer is underlain by grayish brown loam that extends to limestone bedrock at a depth of about 14 inches. These soils are shallow or very shallow and are moderately sloping to moderately steep.

The soils in this association are used for range, wildlife habitat, watershed, and community development.

Shallow To Deep Soils on Mountains and Foot Slopes

Soil associations 12 and 13 are shallow to deep, well drained, very cobbly, stony, very stony, and loamy soils on mountains and footslopes. The soils formed in residuum. The native vegetation is mid grasses, shrubs, oneseed juniper, pinyon pine, ponderosa pine, Douglas-fir, and white fir. Elevations range from 6,000 to 10,500 feet.

12. Seis-Orthids association

Shallow or moderately deep, level to very steep, well drained, very cobbly, stony, and very stony loamy soils

This association is in level to very steep areas in the eastern part of the survey area. The native vegetation is pinyon pine, oneseed juniper, Gambel oak, mountain-mahogany, skunkbush sumac, and mid and short grasses. Elevations range from 6,000 to 8,000 feet. The mean annual precipitation is 12 to 18 inches, the mean annual air temperature is 43° to 55° F, and the frost-free season is 110 to 160 days.

This association makes up 12 percent of the survey area. It is about 28 percent Seis soils, 12 percent Orthids, and 60 percent Salas, Silver, La Fonda, Carlito, Millett, Tesajo, Bond, Scholle, Burnac, and Ildefonso soils and Ustolls, Rock outcrop, and Badland.

Seis soils typically are pinkish gray very cobbly loam and very stony clay loam underlain by limestone bedrock at a depth of about 30 inches. They are moderately deep, level to steep soils that formed in residuum weathered from limestone on the sides of mountains.

Orthids typically have a surface layer of light brown, pale brown, or brown stony or very stony loam. This layer is underlain by reddish brown, brown, or strong brown very gravelly loam or very stony sandy loam

that extends to bedrock at a depth of 10 to 30 inches. These soils are shallow to moderately deep and steep or very steep. They formed in residuum weathered from granite, gneiss, schist, limestone, and sandstone on sides of canyons and mountains.

The soils in this association are used for range, wildlife habitat, watershed, and recreation.

13. *Kolob-Rock outcrop association*

Deep, moderately steep to very steep, well drained loamy and stony soils and Rock outcrop

This association is on moderately steep to very steep mountains in the eastern part of the survey area. The native vegetation is ponderosa pine, Douglas-fir, Gambel oak, mountainmahogany, bottlebrush squirreltail, and junegrass. Elevations range from 8,400 to 10,500 feet. The mean annual air temperature is 43° to 45° F, and the frost-free season is 60 to 100 days.

This association makes up 8 percent of the survey area. It is about 28 percent Kolob soils, 24 percent Rock outcrop, and 48 percent Pino, Laporte, and Sandia soils, Borolls, and the Kolob variant.

Kolob soils typically have a surface layer of dark grayish brown stony loam and stony clay loam and a subsoil of brown stony clay and very stony clay. Limestone bedrock is at a depth of about 42 inches.

Rock outcrop is on the mesa breaks, canyon walls, and sides of ridges where resistant limestone, schist, gneiss, sandstone, or granite has been exposed through faulting, uplifting, or geologic erosion.

The soils in this association are used for wildlife habitat, watershed, recreation, timber, and range.

Descriptions of the Soils

This section describes the soil series and mapping units in Bernalillo County and parts of Sandoval and Valencia Counties. Each soil series is described in detail, and then each mapping unit in that series is described briefly. Unless specifically mentioned, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. Unless otherwise noted, color terms describe a dry soil. If a soil feature is not mentioned in the description of the horizon, the feature did not occur or was not determined.

The profile described in the series is representative of mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit or are apparent in the name of the mapping unit.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Badland, for example, does not belong to a soil series, but is listed in alphabetic order along with the soil series.

Preceding the name of each mapping unit is a symbol which identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the irrigated capability unit or dryland capability subclass in which the mapping unit has been placed. The page for the description of each irrigated capability unit can be found by referring to the "Guide to Mapping Units" at the back of this survey.

This survey area was mapped at mixed intensities to meet the expected uses. The irrigated cropland and the expanding urban area on the Rio Grande Valley floor were mapped at high intensity, and the mapping units are narrowly defined. The Indian reservations lying outside the Rio Grande flood plain and the national forest were mapped at medium intensity, and the mapping units are broadly defined.

The type of symbol indicates in which intensity the soil occurs. The first letter is a capital for both high and medium intensity symbols. The second letter is a capital for medium intensity mapping units, such as Kolob stony loam (**KS**), and a small letter for high intensity units, such as Agua loam (**Af**). The third letter, always a capital, indicates slope class. Most symbols without slope letters are for nearly level soils, but some are for miscellaneous land types, soil associations, or undifferentiated groups that have a wide range of slope.

The units mapped at high intensity were examined at closer intervals, are more homogeneous, contain fewer inclusions, and are more narrowly defined than the units mapped at medium intensity. The units shown as soil associations or miscellaneous land types were mapped primarily at medium intensity. Slope classes were combined in the medium intensity survey if there was no significant difference in use and management. The scale of the soil maps at the back of this survey is the same for both intensities.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*5*).[2]

Agua Series

The Agua series consists of deep, well drained soils that formed in recent alluvium on the flood plain along the Rio Grande. Slopes are 0 to 1 percent. The native vegetation is principally alkali sacaton, inland saltgrass, and fourwing saltbush. Elevations range from 4,850 to 5,050 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 165 to 185 days. Agua soils are mainly associated with Brazito, Gila, and Vinton soils.

In a representative profile, the surface layer is light brown loam about 10 inches thick. Next is about 14 inches of brown loam and pink very fine sandy loam.

Italicized numbers in parentheses refer to Literature Cited, p. 97

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres		Percent
	Narrowly defined (high intensity)	Broadly defined (medium intensity)	
Agua loam	1,840		0.2
Agua silty clay loam	1,424		.2
Agua loam, wet variant	260		(1)
Akela-Rock outcrop complex, 1 to 9 percent slopes	2,400		.3
Alemeda sandy loam, 0 to 5 percent slopes	8,680		1.1
Anapra silt loam	666		.1
Anapra silty clay loam	321		(1)
Armijo clay loam	307		(1)
Badland	5,374		.7
Bluepoint fine sand, hummocky	2,198		.3
Bluepoint loamy fine sand, 1 to 3 percent slopes	680		.1
Bluepoint loamy fine sand, 1 to 9 percent slopes		72,000	9.1
Bluepoint-Wink, severely eroded complex	9,000		1.1
Bluepoint-Kokan association, hilly		66,000	8.3
Borolls-Rock outcrop association, very steep		4,880	.6
Brazito fine sandy loam	1,459		.2
Brazito silty clay loam	1,154		.2
Brazito complex	1,524		.2
Burnac gravelly loam, 20 to 60 percent slopes		538	.1
Carlito complex, 15 to 80 percent slopes		4,336	.6
Cut and fill land	3,460		.4
Embudo gravelly fine sandy loam, 0 to 5 percent slopes	7,957		1.0
Embudo-Tijeras complex, 0 to 9 percent slopes	15,348		1.9
Gila fine sandy loam		3,700	.5
Gila loam	4,804		.6
Gila loam, slightly saline	260		(1)
Gila loam, moderately alkali	457		.1
Gila clay loam	3,710		.5
Gila complex, moderately alkali		900	.1
Gila-Hantz complex		13,724	1.7
Glendale loam	1,218		.2
Glendale clay loam	1,960		.3
Glendale clay loam, slightly saline	321		(1)
Hantz silty clay loam	9,517		1.2
Ildefonso gravelly sandy loam, 1 to 9 percent slopes		770	.1
Kim fine sandy loam, 1 to 8 percent slopes	1,760		.2
Kim silty clay loam, 3 to 5 percent slopes	1,380		.2
Kim-Badland association		2,966	.4
Kokan gravelly sand, 10 to 40 percent slopes		10,734	1.4
Kokan-Rock outcrop association		1,847	.2
Kolob stony loam		1,752	.2
Kolob-Rock outcrop association		4,589	.6
Kolob-Sandia association		5,658	.7
Kolob stony loam, cold variant, 15 to 40 percent slopes		1,152	.1
La Fonda loam	1,100		.1
Laporte-Rock outcrop complex, 20 to 45 percent slopes		4,080	.5
Laporte-Rock outcrop-Escabosa complex, 5 to 20 percent slopes		34,380	4.4
Latene sandy loam, 1 to 5 percent slopes	7,940		1.0
Madurez loamy fine sand, 1 to 5 percent slopes	26,240		3.3
Madurez-Bluepoint complex, 1 to 9 percent slopes	3,800		.5
Madurez-Wink association, gently sloping		51,200	6.5
Madurez-Wink association, undulating		6,000	.8
Manzano loam	5,525		.7
Nickel-Latene association		905	.1
Otero fine sandy loam		4,873	.6
Pajarito loamy fine sand, 1 to 9 percent slopes		13,090	1.7
Pajarito fine sandy loam, 1 to 5 percent slopes	9,120		1.2
Penistaja loamy fine sand, 1 to 5 percent slopes		11,130	1.5
Penistaja fine sandy loam, 1 to 5 percent slopes		17,763	2.2
Penistaja-Bond association		25,399	3.2
Pino-Rock outcrop association		6,400	.8
Rock outcrop	7,790		1.0
Rock outcrop-Akela complex, 10 to 50 percent slopes		1,000	.1
Rock outcrop-Bond complex, 5 to 35 percent slopes		3,700	.5
Rock outcrop-Laportecomplex, 30 to 80 percent slopes		20,900	2.6
Rock outcrop-Orthids complex, 40 to 80 percent slopes		32,239	4.1
Rock outcrop-Ustolls complex, 15 to 70 percent slopes		8,200	1.0
Salas complex, 20 to 80 percent slopes		8,704	1.1
Sandia-Kolob complex, 15 to 40 percent slopes		1,760	.2
Scholle-Ildefonso association		1,280	.2
Seis very cobbly loam, 0 to 15 percent slopes		954	.1
Seis stony loam, 15 to 60 percent slopes		4,745	.6
Seis-Silver complex, 10 to 40 percent slopes		18,756	2.4
Seis complex, 30 to 80 percent slopes		12,161	1.5
Shingle-Badland complex, eroded, 2 to 40 percent slopes	2,120		.3
Shingle, eroded-Kim association		9,439	1.2
Silver fine sandy loam, 0 to 2 percent slopes	1,462		.2
Silver fine sandy loam, moderately alkali, 0 to 2 percent slopes	630		.1
Silver and Witt soils, 2 to 5 percent slopes	11,936		1.5
Silver and Witt soils, 5 to 9 percent slopes	42,210		5.3
Tesajo-Millett stony sandy loams	7,246		.9
Tijeras gravelly fine sandy loam, 1 to 5 percent slopes	15,736		2.0
Tome very fine sandy loam	5,360		.7

See footnote at end of table.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Acres		Percent	Soil	Acres		Percent
	Narrowly defined (high intensity)	Broadly defined (medium intensity)			Narrowly defined (high intensity)	Broadly defined (medium intensity)	
Torrifluvents, frequently flooded		2, 323	. 3	Vinton clay loam	747		. 1
Travessilla fine sandy loam, 1 to 15 percent slopes		7, 943	1. 0	Vinton and Brazito soils, occasionally flooded		3, 539	. 4
Travessilla-Rock outcrop association		2, 575	. 3	Wink fine sandy loam, 0 to 5 percent slopes	17, 202		2. 2
Vinton loamy sand	1, 971		. 2	Wink-Embudo complex, 0 to 5 percent slopes	2, 760		. 3
Vinton sandy loam, 0 to 1 percent slopes	3, 679		. 5	Wink-Madurez association		13, 470	1. 7
Vinton sandy loam, 1 to 3 percent slopes		2, 010	. 3	Total	264, 013	526, 464	100. 0

[1] Less than 0.05 percent.

Below this to a depth of 60 inches or more is very pale brown fine sand. The soil is moderately alkaline throughout.

Permeability is moderate to a depth of about 24 inches and rapid below. Available water capacity is 5 to 7 inches. Effective rooting depth is about 20 to 36 inches.

Agua soils are used for irrigated alfalfa, row crops, and pasture. They are also used for wildlife habitat and community development.

Representative profile of Agua loam, 150 feet west of irrigation ditch in the southeast corner of NE¼NW¼ sec. 6, T. 9 N., R. 3 E.

Ap—0 to 10 inches, light brown (7.5YR 6/4) loam, brown (10YR 4/4) moist; very weak, fine, subangular blocky structure; slightly hard, friable; many very fine roots; many very fine tubular pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

C1—10 to 14 inches, brown (7.5YR 5/2) heavy loam, dark brown (7.5YR 4/2) moist; weak, coarse, subangular blocky structure; slightly hard, friable; many very fine roots; many very fine tubular pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

C2—14 to 24 inches, pink (7.5YR 7/4) very fine sandy loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable; many very fine roots; many very fine tubular pores; moderately calcareous; moderately alkaline; clear, wavy boundary.

IIC3—24 to 60 inches, very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; single grained; loose; many fine interstitial pores; many organic and iron stains on sand grains; slightly calcareous; moderately alkaline.

Depth to the IIC horizon ranges from 24 to 34 inches. The A horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 2 to 4 dry and moist. The C horizon has hue of 7.5YR or 10YR, value of 5 to 7 dry and 4 to 6 moist, and chroma of 2 to 4. It is stratified alluvium that averages loam, fine sandy loam, or very fine sandy loam and less than 18 percent clay, The IIC horizon ranges from fine sand to coarse sand.

Af—Agua loam. This level soil is in the irrigated Rio Grande Valley. It has the profile described as representative of the series. In most areas the water table is below 60 inches, but in some it fluctuates between 45 and 60 inches. Slopes are 0 to 1 percent. Included in mapping are small areas of Gila soils, Brazito fine sandy loam, and Agua loam, wet variant.

Runoff is very slow, and the hazard of erosion is slight.

This soil is used for irrigated alfalfa, row crops, and tame pasture. It is also used for wildlife habitat and community development. Irrigated capability unit IIs–4.

Ag—Agua silty clay loam. This level soil is in the irrigated Rio Grande Valley. It has a profile similar to that described as representative of the series, but the surface layer differs in texture. In most areas the water table is below 60 inches, but in some it fluctuates between 45 and 60 inches. Slopes are 0 to 1 percent. Included in mapping are small areas of Gila soils and Brazito silty clay loam.

Runoff is very slow, and the hazard of erosion is slight.

This soil is used for irrigated alfalfa, row crops, and tame pasture. It is also used for community development and wildlife habitat. Irrigated capability unit IIs–4.

Agua Variant

The Agua variant consists of deep, somewhat poorly drained soils that formed in recent alluvium on the flood plain along the Rio Grande. Slopes are 0 to 1 percent. The native vegetation is principally alkali sacaton, inland saltgrass, and fourwing saltbush. Elevations range from 4,850 to 5,050 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 165 to 185 days. The Agua variant is mainly associated with Vinton, Gila, and Brazito soils.

In a representative profile, the surface layer is brown loam about 13 inches thick. Next is about 15 inches of pinkish gray loamy very fine sand. Below this is about 2 inches of pinkish gray silty clay loam underlain to a depth of 60 inches or more by pinkish gray sand. The soil is moderately saline. It is strongly alkaline in the upper 28 inches and moderately alkaline below.

Permeability is moderate. A seasonal water table is at a depth of 30 to 60 inches. Available water capacity is 3 to 4 inches. Effective rooting depth is about 20 to 34 inches.

The Agua variant is used for irrigated pasture and for wildlife habitat and recreation.

Representative profile of Agua loam, wet variant, in NE¼SE¼ NE¼ sec. 1, T. 8 N., R. 2 E.

Ap—0 to 13 inches, brown (7.5YR 5/2) loam, brown (7.5YR 4/2) moist; weak, fine, granular structure; slightly hard, friable; many fine, very fine, and coarse roots; common tubular pores; moderately saline; moderately calcareous; strongly alkaline; abrupt, smooth boundary.

C1—13 to 28 inches, pinkish gray (7.5YR 7/2) loamy very fine sand, pinkish gray (7.5YR 6/2) moist; common, faint, strong brown (7.5YR 5/6) mottles; massive; soft, very friable; few very fine roots; many discontinuous interstitial pores; moderately saline; moderately calcareous; strongly alkaline; abrupt, smooth boundary.

C2—28 to 30 inches, pinkish gray (7.5YR 6/2) silty clay loam, brown (7.5YR 5/2) moist; common, distinct, strong brown (7.5YR 5/6) mottles; massive; hard, firm; few fine tubular pores; moderately saline; moderately calcareous; moderately alkaline; abrupt, smooth boundary.

IIC3—30 to 60 inches, pinkish gray (7.5YR 7/2) sand, light brown (7.5YR 6/4) moist; common, distinct, strong brown (7.5YR 6/5) mottles; single grained; loose; many discontinuous interstitial pores; moderately saline; moderately calcareous; moderately alkaline.

Depth to the IIC horizon ranges from 20 to 34 inches. The A horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 2 to 4. It is slightly saline to moderately saline loam or silty clay loam. The C horizon has hue of 7.5YR or 10YR, value of 5 to 7 dry and 4 to 6 moist, and chroma of 2 to 4. It is loam, fine sandy loam, loamy very fine sand, very fine sandy loam, or silty clay loam. It averages less than 18 percent clay. The IIC horizon ranges from fine sand to coarse sand.

Ah—Agua loam, wet variant. This level soil is in the irrigated Rio Grande Valley. It has a seasonal water table at a depth of 30 to 60 inches and is nonsaline to moderately saline. White crusts of salt are common on the surface. Slopes are 0 to 1 percent. Included in mapping are small areas of Gila soils, Brazito fine sandy loam, and soils that are similar to Agua loam, wet variant, but have a surface layer of silty clay loam.

Runoff is slow, and the hazard of erosion is slight.

This soil is used for irrigated pasture and for wildlife habitat and recreation. Irrigated capability unit IVw–1.

Akela Series

The Akela series consists of shallow, well drained soils that formed partly in eolian sediment derived from basalt and partly in material weathered from basalt. These soils are on basalt flows. Slopes are 1 to 9 percent. The native vegetation is black grama, broom snakeweed, winterfat, and Russian-thistle. Elevations range from 5,200 to 5,800 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 170 to 195 days. Akela soils are associated with Alemeda, Bluepoint, Madurez, and Wink soils.

In a representative profile, the surface layer is pale brown cobbly sandy loam about 7 inches thick. Next is about 8 inches of light gray very gravelly sandy loam. Fractured basalt bedrock is at a depth of about 15 inches. The soil is strongly calcareous and moderately alkaline.

Permeability is moderate. Available water capacity is 1 inch to 1.5 inches. Effective rooting depth is 10 to 20 inches.

Akela soils are used for recreation, watershed, wildlife habitat, and range. Local areas are used as a source of basalt stones or volcanic cinders.

Representative profile of Akela cobbly sandy loam, from an area of Akela-Rock outcrop complex, 1 to 9 percent slopes, in the north-central part of N½N½ sec. 28, T. 11 N., R. 2 E.

A1—0 to 7 inches, pale brown (10YR 6/3) cobbly sandy loam, brown (10YR 5/3) moist; single grained coarse sandy loam in upper 1 inch, weak, thick, platy structure below; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine interstitial pores; 30 percent basalt gravel; 5 percent stones and cobblestones; lime is disseminated, except on coatings of pebbles and cobblestones; strongly calcareous; moderately alkaline; clear, wavy boundary.

Cca—7 to 15 inches, light gray (10YR 7/2) gravelly sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine interstitial pores; 40 percent basalt gravel; 30 percent cobblestones; common fine threads and soft masses of lime; strongly calcareous; moderately alkaline; diffuse boundary.

R—15 inches, fractured basalt bedrock, which becomes more dense and less fractured below a depth of 4 feet; lime on surface of basalt and in fractures to a depth of 6 feet.

The soil has hue of 7.5YR or 10YR, value of 5 to 7 dry and 4 to 6 moist, and chroma of 2 to 4. The A horizon is gravelly or cobbly sandy loam, loam, or fine sandy loam. The content of coarse fragments is 15 to 40 percent. The Cca horizon is gravelly sandy loam or gravelly loam. It is 35 to 60 percent coarse fragments. The content of coarse fragments in the entire profile averages 35 to 50 percent. Depth to bedrock ranges from 10 to 20 inches.

AkC—Akela-Rock outcrop complex, 1 to 9 percent slopes. This mapping unit is about 60 percent Akela cobbly sandy loam and 20 percent Rock outcrop.

The Akela soil is on basalt flows mainly on the West Mesa where runoff is medium and the hazard of water erosion is slight or moderate. It occurs as a shallow mantle of soil underlain by basalt bedrock. The Rock outcrop occurs as exposures of bare basalt bedrock.

Included in this unit in mapping are areas of Alemeda, Bluepoint, Madurez, and Wink soils, which make up 15 percent of the unit. Also included are small, concave areas of an Akela soil that has a sandy clay loam or clay loam subsoil.

This mapping unit is used for recreation, watershed, wildlife habitat, and range. The shallow soils severely limit community development. Local areas are used as a source of basalt stones or volcanic cinders. Dryland capability subclass VIIs; native plant community 8 for Akela soil.

Alemeda Series

The Alemeda series consists of moderately deep, well drained soils that formed in eolian sediment underlain by residuum weathered from basalt bedrock. These are nearly level to undulating soils on old basalt flows. Slopes are 0 to 5 percent. The native vegetation is principally mesa dropseed, black grama, galleta, broom snakeweed, winterfat, annual weeds, and some juniper. Elevations range from 5,000 to 6,000 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature

is about 58° to 60° F, and the frost-free season is 170 to 195 days. Alemeda soils are associated with Akela, Bluepoint, Madurez, and Wink soils.

In a representative profile, the surface layer is light yellowish brown sandy loam about 4 inches thick. The subsoil is light yellowish brown loam and pale brown gravelly sandy loam about 9 inches thick. The substratum is about 13 inches of light gray very cobbly sandy loam that is high in lime content. Basalt bedrock is at a depth of about 26 inches. The soil is strongly calcareous and moderately alkaline.

Permeability is moderate. Available water capacity is 2 to 3.5 inches. Effective rooting depth is 20 to 40 inches.

Alemeda soils are used for range, wildlife habitat, and watershed. Some small areas are used for community development.

Representative profile of Alemeda sandy loam, 0 to 5 percent slopes, 330 feet east and 550 feet south of the northwest corner of sec. 28, T. 11 N., R. 2 E.

A1—0 to 4 inches, light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; weak, thick, platy structure; soft, very friable; many fine and very fine roots and interstitial pores; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

B21—4 to 9 inches, light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; weak, medium, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots and interstitial or tubular pores; strongly calcareous; moderately alkaline; clear, smooth boundary.

B22—9 to 13 inches, pale brown (10YR 6/3) gravelly sandy loam, dark brown (10YR 4/3) moist; weak, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine roots and tubular pores; 15 percent gravel and cobblestones; strongly calcareous with segregated lime as coating on pebbles and cobblestones; moderately alkaline; clear, wavy boundary.

IIC1ca—13 to 18 inches, light gray (10YR 7/2) very cobbly sandy loam, grayish brown (10YR 5/2) moist; weak, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine roots and tubular pores; 55 percent gravel and cobblestones; strongly calcareous with segregated lime as many fine and coarse masses and as coatings on pebbles and cobblestones; moderately alkaline; clear, wavy boundary.

IIC2ca—18 to 26 inches, light gray (10YR 7/2) very cobbly sandy loam, grayish brown (10YR 5/2) moist; single grained; loose; few medium roots; many fine and very fine interstitial pores; 50 percent gravel and cobblestones; strongly calcareous with segregated lime as hard, small masses and as coatings on pebbles and cobblestones; moderately alkaline; abrupt, smooth boundary.

IIR—26 inches, basalt bedrock coated with lime.

The A horizon has hue of 7.5YR or 10YR, value of 5 to 7 dry and 4 to 6 moist, and chroma of 2 or 4. It is sandy loam or loam. The B horizon has hue of 7.5YR or 10YR, value of 5 to 7 dry and 4 to 6 moist, and chroma of 2 to 4. It is loam, gravelly sandy clay loam, or gravelly sandy loam. The IICca horizon has hue of 7.5YR to 10YR, value of 7 or 8 dry and 5 to 8 moist, and chroma of 2 to 4. It is very cobbly sandy loam or very cobbly loam that commonly contains some gravel and stones. The content of rock fragments is 35 to 75 percent. Lime content of the fine earth fraction ranges from 15 to 40 percent. Depth to bedrock is 20 to 40 inches.

AmB—Alemeda sandy loam, 0 to 5 percent slopes. This level to undulating soil is on old basalt flows mainly on the West Mesa. From 10 to 30 percent of this mapping unit is basalt rock outcrop and Akela soils. Slopes range from 0 to 9 percent, but are mainly 1 to 5 percent. Included in mapping are Madurez and Wink soils, which make up 5 to 15 percent of this unit. Also included are small areas of a soil that has a surface layer of winnowed loamy sand.

Runoff is medium, the hazard of soil blowing is moderate or severe, and the hazard of water erosion is slight.

This soil is used for range, wildlife habitat, watershed, and community development. Dryland capability subclass VIIe; native plant community 4.

Anapra Series

The Anapra series consists of deep, well drained soils that formed in recent alluvium on the flood plain along the Rio Grande. Slopes are 0 to 1 percent. The native vegetation is alkali sacaton, inland saltgrass, and fourwing saltbush. Elevations range from 4,850 to 5,050 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 165 to 185 days. Anapra soils are associated with Agua, Glendale, and Brazito soils.

In a representative profile, the surface layer is grayish brown silt loam about 8 inches thick. Next is about 16 inches of grayish brown clay loam. Below this to a depth of 60 inches or more is light gray sand and sandy loam. The soil is moderately alkaline throughout.

Permeability is moderately slow to the sand substratum and rapid below. Available water capacity is 6.5 to 7.5 inches. Effective rooting depth is about 20 to 36 inches.

Anapra soils are used for irrigated alfalfa, row crc and pasture. They are also used for wildlife habitat a community development.

Representative profile of Anapra silt loam, in NW¼ NW¼SE¼ sec. 24, T. 9 N., R. 2 E.

Ap—0 to 8 inches, grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate, medium, angular blocky structure; hard, firm, sticky and plastic; many medium and fine roots and tubular pores; few worm casts; moderately calcareous; moderately alkaline; abrupt, smooth boundary.

C1—8 to 24 inches, grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate, medium, angular blocky structure; hard, firm, sticky and plastic; many fine and very fine roots and tubular pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

IIC2—24 to 26 inches, light gray (10YR 7/2) light sandy loam, light brownish gray (10YR 6/2) moist; massive; slightly hard, very friable; common fine and very fine roots and tubular pores; slightly calcareous; moderately alkaline; clear, wavy boundary.

IIC3—26 to 60 inches, light gray (10YR 7/2) sand, light brownish gray (10YR 6/2) moist; single grained; loose; few fine and very fine roots in upper part, none below; many fine interstitial pores; slightly calcareous; moderately alkaline.

Depth to the IIC horizon ranges from 20 to 34 inches. The A horizon has hue of 10YR or 7.5YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 2 or 3. It is silt loam, silty clay loam, or sandy clay loam. The C1 horizon has hue of 10YR or 7.5YR, value of 5 or 6 dry and 3 or 4 moist, and chroma of 2 or 3. It is clay loam or silty clay loam. The IIC horizon has hue of 10YR or 7.5YR, value of 6 or 7 dry and 5 or 6 moist, and chroma of 2 or 3. It is slightly calcareous or noncalcareous fine sand to coarse sand. It is 0 to 15 percent gravel.

In about 25 percent of the area north of Albuquerque, Anapra soils are reddish brown throughout and are therefore redder than is defined as the range for the series. This difference, however, does not alter use or management.

An—Anapra silt loam. This level soil is in the irrigated Rio Grande Valley. It has the profile described as representative of the series. In most areas the seasonal water table is below 60 inches. In about 10 percent of the mapped areas, however, it is at a depth of 45 to 60 inches and the soil is slightly to moderately saline. Slopes are 0 to 1 percent. Included in mapping are small areas of Armijo and Agua soils and an Anapra soil where the surface layer is sandy clay loam or clay loam.

Runoff is slow, and the hazard of erosion is slight.

This soil is used for irrigated alfalfa, row crops, and pasture. It is also used for wildlife habitat and community development. Irrigated capability unit IIs–4.

Ao—Anapra silty clay loam. This level soil is in the irrigated Rio Grande Valley. It has a profile similar to that described as representative of the series, but the surface layer differs in texture. In most areas the seasonal water table is below 60 inches. In about 30 percent of the mapped areas, however, it is at a depth of 45 to 60 inches and the soil is slightly to moderately saline. In about 4 percent the soil is moderately alkali affected. Slopes are 0 to 1 percent. Included in mapping are small areas of Glendale and Armijo soils and Anapra silt loam.

Runoff is very slow, and the hazard of erosion is slight.

This soil is used for irrigated alfalfa, row crops, and pasture. It is also used for wildlife habitat and community development. Irrigated capability unit IIs–4.

Armijo Series

The Armijo series consists of deep, well drained soils that formed in alluvial sediment in old oxbow lakes or sloughs on the flood plain along the Rio Grande. Slopes are 0 to 1 percent. The native vegetation is principally alkali sacaton, inland saltgrass, fourwing saltbush, and annuals. Elevations range from 4,850 to 5,350 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 165 to 185 days. Armijo soils are associated with Glendale, Anapra, and Gila soils.

In a representative profile, the surface layer is brown clay loam about 8 inches thick. Next is about 38 inches of light reddish brown, brown, and pinkish gray clay. Below this to a depth of more than 60 inches is light brownish gray sandy loam and pale brown loamy sand. The soil is slightly calcareous and moderately alkaline.

Permeability is very slow. Available water capacity to a depth of 60 inches is 6.5 to 8 inches. Effective rooting depth is 60 inches or more.

Armijo soils are used for irrigated alfalfa, row crops, and pasture. They are also used for wildlife habitat and community development.

Representative profile of Armijo clay loam, 186 feet north and 50 feet west of the point where the Pajarito Lateral crosses the Arenal Main Canal. This area is not sectionized, but if it were, the site would occur in the central part of sec. 11, T. 9 N., R. 2 E.

Ap—0 to 8 inches, brown (7.5YR 5/4) clay loam, dark brown (7.5YR 3/4) moist; moderate, medium, subangular blocky structure; hard, firm, sticky and plastic; many medium and fine roots and pores; slightly calcareous; moderately alkaline; clear, smooth boundary.

C1—8 to 22 inches, pinkish gray (5YR 6/2) clay, dark reddish gray (5YR 4/2) moist; weak, coarse, prismatic structure parting to weak, fine and medium, blocky structure; very hard, firm, very sticky and very plastic; many medium and fine roots; many medium and fine continuous vertical tubular pores; many slickensides; many pressure faces at oblique angles from vertical; slightly calcareous; moderately alkaline; clear, smooth boundary.

C2—22 to 46 inches, stratified light reddish brown (5YR 6/3) and brown (7.5YR 4/2) clay, dark grayish brown (10YR 4/2) moist; few, fine and medium, distinct mottles, yellowish red (5YR 4/6) and reddish brown (2.5YR 5/4) moist, becoming common with increasing depth, especially along root channels; massive; very hard, firm, very sticky and very plastic; many fine and very fine roots and tubular pores; few pressure faces and cracks; slightly calcareous; moderately alkaline; abrupt, smooth boundary.

IIC3—46 to 50 inches, light brownish gray (10YR 6/2) sandy loam, dark brown (7.5YR 4/2) moist; common, medium and fine, prominent mottles, yellowish red (5YR 4/6) moist; massive; hard, very friable; many very fine interstitial pores; slightly calcareous; moderately alkaline; clear, smooth boundary.

IIC—50 to 67 inches, pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; single grained; loose; many very fine interstitial pores; slightly calcareous; moderately alkaline.

Depth to the IIC horizon ranges from 42 to 60 inches. The A horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and 3 or 4 moist, and chroma of 2 to 4 dry and moist. It is clay loam or silty clay loam. The C1 and C2 horizons have hue of 5YR to 10YR, value of 4 to 6 dry and 3 or 4 moist, and chroma of 2 to 4 dry and moist. They are clay or silty clay that is 40 to 50 percent clay. The IIC horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 2 to 4 dry and moist. It is sandy loam, loamy sand, or sand.

Ar—Armijo clay loam. This level soil is in the irrigated Rio Grande Valley. In most areas the seasonal water table is below 60 inches. In about 25 percent of the mapped areas, however, it is at a depth of 45 to 60 inches and the soil is slightly to moderately saline. Slopes are 0 to 1 percent. Included in mapping are small areas of Glendale clay loam, Agua silty clay loam, and, along the Valcenia county line, a soil that is similar to Armijo soils but has an underlying layer of loam about 30 inches thick.

Runoff is very slow, and the hazard of erosion is slight.

This soil is used for irrigated alfalfa, row crops, and pasture. Some areas are used for wildlife habitat and community development. The failure of septic tank filter fields and the cracking of foundations are common problems where this soil is used for community development. Irrigated capability unit IIIs–1.

Badland

Ba—Badland consists mainly of dissected weathered soft shale; some bedded and weakly cemented sandstone, siltstone, and conglomerate lenses; and unconsolidated material. It is moderately steep to very steep; slopes are mainly 15 to 75 percent. There is little or no vegetation. Elevations range from 5,000 to 8,000 feet. The mean annual precipitation is 8 to 17 inches, the mean annual air temperature is 48° to 60° F, and the frost-free season is 120 to 200 days.

West of the Rio Puerco, Badland consists of weathered soft shale and weakly consolidated sandstone, siltstone, and conglomerate. Included in mapping are mainly areas of Shingle and Kim soils.

In the foothills, Badland is mainly weathered soft shale, but commonly has a thin mantle of limestone, sandstone, granite, gneiss, or schist. Included in mapping is mainly Borolls-Rock outcrop association, very steep.

Permeability is variable, runoff is rapid to very rapid, and the hazard of water erosion is severe. Active geologic erosion is prevalent.

Badland is used for watershed and has limited use for wildlife habitat. Dryland capability subclass VIIIe.

Bluepoint Series

The Bluepoint series consists of deep, somewhat excessively drained soils that formed in sandy alluvial and eolian sediments on alluvial fans and terraces. Slopes are 1 to 15 percent. The native vegetation is principally mesa dropseed and Indian ricegrass and some giant dropseed and black grama. Elevations range from 4,850 to 6,000 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 165 to 195 days. Bluepoint soils are associated with Kokan, Latene, Madurez, and Wink soils.

In a representative profile, the surface layer is pale brown loamy fine sand about 8 inches thick. The underlying material to a depth of 60 inches or more is pale brown and light yellowish brown loamy sand. The soil is slightly calcareous and mildly alkaline or moderately alkaline.

Permeability is rapid. Available water capacity is 4 to 5.5 inches. Effective rooting depth is 60 inches or more.

Bluepoint soils are used for range, irrigated crops, watershed, wildlife habitat, and community development.

Representative profile of Bluepoint loamy fine sand, 1 to 9 percent slopes, 30 feet west of the El Paso Natural Gas Pipeline Road, northeast corner of sec. 5, T. 11 N., R. 2 E.

A1—0 to 8 inches, pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; single grained; loose; many fine and very fine roots and interstitial pores; slightly calcareous; mildly alkaline; clear, wavy boundary.

C1—8 to 20 inches, pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; massive; slightly hard, very friable; few very fine and fine roots; many very fine interstitial pores; slightly calcareous; moderately alkaline; clear, wavy boundary.

C2—20 to 60 inches, light yellowish brown (10YR 6/4) loamy sand, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable; few fine and very fine roots; many very fine interstitial pores; slightly calcareous in spots; mildly alkaline.

The A horizon has value of 5 to 7 dry and 4 to 6 moist and chroma of 2 to 4. It is sand, loamy fine sand, and loamy sand. The C horizon has hue of 5YR to 10YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 3 or 4. It is loamy sand or loamy fine sand. Gravel content ranges from 0 to 15 percent throughout the profile.

Where mapping units BCC and Bd3 occur west of the Rio Puerco, the mean annual temperature is a few degrees cooler than is defined as the range for the series. This difference, however, does not alter use and management.

Bb—Bluepoint fine sand, hummocky. This gently rolling to r lling soil is on the piedmont east of the Rio Puerco and in areas near basalt flows. It occurs as low dunes 8 to 50 feet high of reworked sand. The windward side is generally a blowout, and the leeward side is low dunes. Areas generally are 15 to 100 acres in size. Vegetation is sparse. Slopes are 5 to 15 percent.

This soil has a profile similar to that described as representative of the series, but the surface layer differs in texture.

Runoff is slow. The hazard of soil blowing is severe.

This soil is used for range, watershed, wildlife habitat, and recreation. Dryland capability subclass VIIe; native plant community 2.

BcA—Bluepoint loamy fine sand, 1 to 3 percent slopes. This nearly level soil is along the margin of the irrigated Rio Grande Valley. It has a profile similar to that described as representative of the series, but on about 10 percent of the acreage the surface layer is fine sand. Included in mapping are areas of Pajarito and Vinton soils, which make up about 10 percent of the unit.

Runoff is slow, and the hazard of soil blowing is severe.

This soil is used for irrigated alfalfa, row crops, and pasture. It is also used for wildlife habitat and community development. Irrigated capability unit IIIe–11.

BCC—Bluepoint loamy fine sand, 1 to 9 percent slopes. This soil is nearly level to moderately sloping. It has the profile described as representative of the series, but on about 10 percent of the acreage the surface layer is sand. Included in mapping are areas of Madurez, Pajarito, and Wink soils, which make up about 15 percent of the unit.

Runoff is slow, and the hazard of soil blowing is severe.

This soil is used for range, watershed, wildlife habitat, recreation, and community development. Dryland capability subclass VIIe; native plant community 2.

Bd3—Bluepoint-Wink, severely eroded complex. This mapping unit is about 45 percent a Bluepoint loamy fine sand that has 3 to 15 percent slopes and 35 percent a severely eroded Wink sandy loam that has 5 to 15 percent slopes (fig. 3).

The Bluepoint soil is in low swales and drainageways where runoff is slow but the hazard of soil blowing is severe. The Wink soil occurs as eroded remnants of narrow ridges where runoff is rapid and the hazard of water erosion is severe. It has a profile similar to that described as representative of the Wink series, but the surface layer is sandy loam and the soil is severely eroded.

Included in this unit in mapping are areas of Vinton, Penistaja, and Kokan soils, which make up about 15 percent of the unit. Also included are areas where the upper 30 inches of the soil is 10 to 15 percent gravel.

This mapping unit is used for watershed, wildlife habitat, and range. Dryland capability subclass VIIe; native plant community 2 for Bluepoint soil and 6 for Wink soil.

BKD—Bluepoint-Kokan association, hilly. This mapping unit is about 50 percent a Bluepoint loamy fine sand that has 5 to 15 percent slopes and 40 percent a Kokan gravelly sand that has 15 to 40 percent slopes. The gently rolling to rolling Bluepoint soil is on fans between gravelly ridges of the hilly to steep Kokan soil.

The Kokan soil has the profile described as representative of the Kokan series. On about 10 percent of the acreage, however, it has a high lime layer in the substratum.

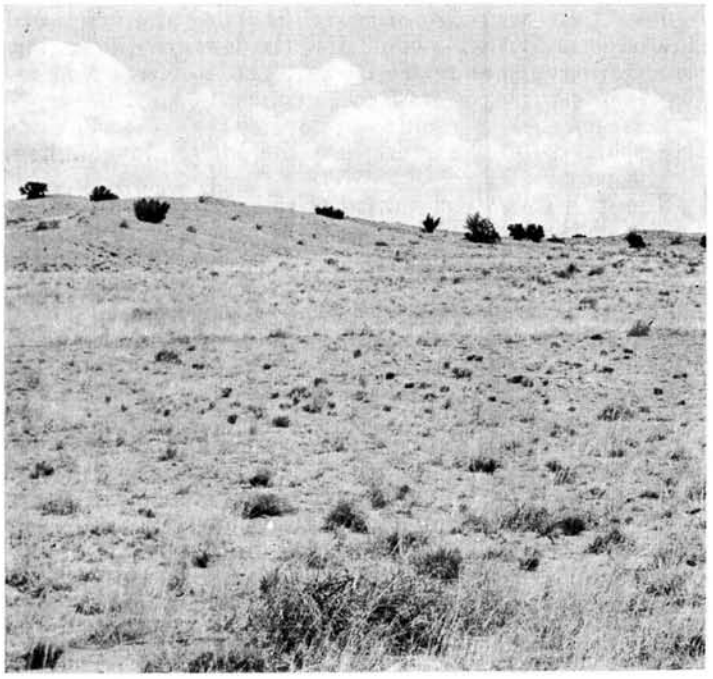

Figure 3.—**An area of Bluepoint-Wink, severely eroded complex.**

On both soils, runoff is slow and the hazard of water erosion is moderate or severe.

This mapping unit is used for range, watershed, wildlife habitat, recreation, and community development. In Bernalillo County it is also a major source of sand and gravel. Dryland capability subclass VIIe; native plant community 2 for Bluepoint soil and 3 for Kokan soil.

Bond Series

The Bond series consists of shallow, well drained soils that formed in residuum weathered from sandstone bedrock on uplands. Slopes are 5 to 15 percent. The native vegetation is principally blue grama, side-oats grama, pinyon pine, and juniper. Elevations range from 6,000 to 8,000 feet. The mean annual precipitation is 12 to 16 inches, the mean annual air temperature is about 50° to 54° F, and the frost-free season is 110 to 150 days. Bond soils are associated with Laporte, Penistaja, and Travessilla soils.

In a representative profile, the surface layer is brown fine sandy loam about 3 inches thick. The subsoil is brown and strong brown sandy clay loam about 15 inches thick. Hard, brown sandstone bedrock is at a depth of about 18 inches. The soil is moderately alkaline throughout.

Permeability is moderately slow. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches.

Bond soils are used for range, watershed, and wildlife habitat.

In this survey area, Bond soils are mapped only with Penistaja soils and Rock outcrop.

Representative profile of Bond fine sandy loam, from an area of Penistaja-Bond association in SW¼NE¼NE¼ sec. 27, T. 11 N., R. 3 W.

A1—0 to 3 inches, brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; single grained; loose; many roots of all sizes; many fine interstitial pores; moderately alkaline; abrupt, smooth boundary.

B2t—3 to 12 inches, brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; moderate, medium, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many roots of all sizes; many fine interstitial pores; moderately alkaline; clear, smooth boundary.

B3—12 to 18 inches, strong brown (7.5YR 5/6) sandy clay loam, strong brown (7.5YR 4/6) moist; weak, fine, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common roots of all sizes; common interstitial pores; moderately alkaline; abrupt, smooth boundary.

R—18 inches, brown (7.5YR 5/4) hard sandstone.

The A horizon has hue of 7.5 or 10YR and value of 4 or 5 dry and 3 or 4 moist. It is stony heavy sandy loam to fine sandy loam. The B horizon has value of 5 to 7 dry and 4 to 6 moist and chroma of 4 to 6 dry and moist. It is sandy clay loam or clay loam that is 0 to 20 percent rock fragments. Depth to bedrock is 12 to 20 inches.

Borolls

Borolls are shallow to deep, well drained soils that formed mostly in residuum weathered from limestone, sandstone, granite, gneiss, and schist on the sides of canyons and mountains in a cool climate. Slopes are 50 to 80 percent. The native vegetation is variable, but is principally ponderosa pine, Douglas-fir, Gambel oak, mountainmahogany, bottlebrush squirreltail, and junegrass. Elevations range from 8,000 to 9,500 feet. The mean annual precipitation is 16 to 25 inches, the mean annual air temperature is 40° to 45° F, and the frost-free season is 70 to 100 days. Borolls soils are mainly associated with Rock outcrop.

Borolls are variable, but they have some features in common. The surface layer is brown, dark brown, or dark grayish brown stony loam, cobbly loam, or very stony loam. The subsoil is stony sandy clay loam to very stony clay. Bedrock is at a depth of 10 to more than 60 inches. The soils are mainly noncalcareous and neutral to mildly alkaline.

Permeability is moderate to slow. Available water capacity is 1 inch to 6 inches. Effective rooting depth is 10 to 60 inches.

Borolls are used for wildlife habitat, watershed, recreation, timber, and range.

BOF—Borolls-Rock outcrop association, very steep. This mapping unit is about 70 percent Borolls, 20 percent Rock outcrop, and 10 percent a very shallow soil and Orthids. It is on the west face of the Sandia, Manzanita, and Manzano Mountains at elevations higher than 8,000 feet.

Borolls are shallow to deep and stony, cobbly, or very stony soils on very steep canyon and mountain walls between the outcrops of bedrock. Runoff is medium, and the hazard of water erosion is moderate. Rock outcrop occurs where resistant limestone, schist, gneiss, sandstone, or granite has been exposed through faulting, uplifting, or geologic erosion. Runoff is very rapid, and the hazard of water erosion is moderate. There is little or no vegetation. About 20 percent of the surface area of this mapping unit is covered with boulders 3 to 15 feet in diameter.

This mapping unit is used for wildlife habitat, watershed, recreation, timber, and range. Dryland capability subclass VIIs for Borolls and VIIIs for Rock outcrop; native plant community 11 and timber suitability group 5 for Borolls.

Brazito Series

The Brazito series consists of deep, well drained soils that formed in recent alluvium on the flood plain along the Rio Grande. Slopes are 0 to 1 percent. The native vegetation is principally sand sagebrush, sand dropseed, alkali sacaton, and annual weeds. Elevations range from 4,850 to 5,050 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 165 to 185 days. Brazito soils are associated with Vinton, Gila, Agua, Anapra, and Glendale soils.

In a representative profile, the surface layer is light reddish brown and reddish brown silty clay loam about 9 inches thick. Below this to a depth of 60 inches or more is light brown coarse sand. The soil is moderately alkaline throughout.

Permeability is rapid below a depth of 3 to 12 inches. Available water capacity is 3.5 to 5.5 inches. Effective rooting depth is limited for most plants by the low available water capacity of the sand layer at a depth of 3 to 12 inches.

Brazito soils are used mainly for irrigated alfalfa, row crops, and pasture. They are also used for wildlife habitat and community development.

Representative profile of Brazito silty clay loam, from an area of Brazito complex, NW¼NE¼ sec. 24, T. 9 N., R. 2 E.

Ap1—0 to 5 inches, light reddish brown (5YR 6/3) silty clay loam, reddish brown (5YR 4/3) moist; strong, very fine, granular structure; hard, firm, slightly sticky and plastic; many very fine and fine roots; many very fine interstitial pores; slightly calcareous; moderately alkaline; abrupt, smooth boundary.

Ap2—5 to 9 inches, reddish brown (5YR 5/3) silty clay loam, reddish brown (5YR 4/3) moist; massive; very hard, firm, slightly sticky and plastic; many very fine and fine roots; many fine tubular pores; slightly calcareous; moderately alkaline; clear, smooth boundary.

IIC—9 to 60 inches, light brown (7.5YR 6/4) coarse sand, brown (7.5YR 5/4) moist; single grained; loose; many fine interstitial pores; moderately alkaline.

Depth to the IIC horizon ranges from 3 to 12 inches. The A horizon has hue of 5YR or 7.5YR, value of 5 or 6 dry, and chroma of 2 or 3 dry and moist. It is clay loam, sandy clay loam, sand, loamy sand, fine sandy loam, loam, or silty clay loam. The IIC horizon has hue of 7.5YR or 10YR, value of 5 to 7 dry and 4 to 6 moist, and chroma of 2 to 4 dry and moist. It is sand that is less than 5 percent silt and clay.

Br—Brazito fine sandy loam. This level soil is in the irrigated Rio Grande Valley. It has a profile similar to that described as representative of the series, but the surface layer differs in texture and in some areas is 12 to 14 inches thick. In about 1 percent of the mapped areas this soil is slightly to moderately saline. In most areas the water table is below 60 inches, but in 2 percent of the mapped areas it fluctuates between 45 and 60 inches. Slopes are 0 to 1 percent. Included in mapping are small areas of Agua loam and Gila loam.

Runoff is very slow, and the hazard of water erosion is slight. Permeability is moderate to the underlying strongly contrasting sand layer and rapid below. Available water capacity is 4 to 5.5 inches.

This soil is used for irrigated alfalfa and pasture. It is also used for wildlife habitat and community development. Sewage effluent can contaminate the underground water supplies where this soil is used for community development. Irrigated capability unit IIIs–8.

Bs—Brazito silty clay loam. This level soil is in the Rio Grande Valley. It has a profile similar to that described as representative of the series, but the surface layer is commonly 12 inches thick and in some areas is 12 to 14 inches thick. The surface layer is silty clay loam because plowing has mixed the fines from silty irrigation water with the underlying sand. In most areas the seasonal water table is below 60 inches. In about 7 percent of the mapped areas, however, it is at a depth of 45 to 60 inches and the soil is slightly to moderately saline. Slopes are 0 to 1 percent. Included in mapping are small areas of Agua silty clay loam and Brazito fine sandy loam.

Runoff is slow, and the hazard of water erosion is slight. Permeability is moderate to the underlying strongly contrasting sand layer and rapid below. Available water capacity is 4 to 5.5 inches.

This soil is used for irrigated alfalfa, row crops, and tame pasture. It is also used for wildlife habitat and community development. Sewage effluent can contaminate underground water supplies where this soil is used for community development. Irrigated capability unit IIIs–8.

Bt—Brazito complex. This mapping unit consists of the Brazito silty clay loam that has the profile described as representative of the Brazito series and other soils that have a surface layer of sand, loamy sand, sandy loam, sandy clay loam, clay loam, or loam 3 to 10 inches thick. The texture varies within short distances. Slopes are 0 to 1 percent.

This mapping unit is in level areas of the irrigated Rio Grande Valley where runoff is very slow and the hazard of water erosion is slight. The hazard of soil blowing is mainly moderate, but is severe where the surface layer is sand and loamy sand. In about 25 percent of the mapped area the soils have a layer of gravelly sand below the surface layer. They are mildly alkaline to strongly alkaline and are nonsaline to moderately saline. In most areas the water table is below 60 inches, but in some it is above 60 inches.

Included in this unit in mapping are small areas of Gila, Vinton, and Agua soils.

This mapping unit is used mainly for permanent pasture, wildlife habitat, and community development. Seepage from septic tank absorption fields can contaminate nearby water supplies where this soil is used for community development. Irrigated capability unit IVe–11.

Burnac Series

The Burnac series consists of deep, well drained soils that formed in residuum weathered from soft shale and sandstone on the sides of mountains. Slopes are 20 to 60 percent. The native vegetation is principally Douglas-fir, white fir, Gambel oak, oregongrape, Kentucky bluegrass, and mountain brome. Elevations range from 8,000 to

9,000 feet. The mean annual precipitation is 18 to 25 inches, the mean annual air temperature is 41° to 45° F, and the frost-free season is 60 to 100 days. Burnac soils are associated with Carlito and Sandia soils.

In a representative profile, the surface layer is dark grayish brown gravelly loam and brown very gravelly loam about 6 inches thick. The upper 8 inches of the subsoil is light reddish brown gravelly sandy clay loam, and the lower 27 inches is reddish brown clay. The substratum to a depth of 60 inches or more is yellowish red clay. The soil is noncalcareous and slightly acid to neutral.

Permeability is very slow. Available water capacity is 8 or 9 inches. Effective rooting depth is about 60 inches.

Burnac soils are used for timber, range, wildlife habitat, and watershed.

Representative profile of Burnac gravelly loam, 20 to 60 percent slopes, in NW¼SW¼ sec. 14, T. 11 N., R. 5 E.

O1—1 inch to 0, decomposed and decomposing forest litter.
A11—0 to 2 inches, dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate, very fine and fine, granular structure; soft, friable; few very fine and fine roots; many very fine and fine interstitial pores; 30 percent gravel and 10 percent cobblestones; neutral; gradual, smooth boundary.
A12—2 to 6 inches, brown (10YR 4/3) very gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate, very fine and fine, granular structure; soft, friable; many very fine and fine roots and interstitial pores; 50 percent gravel and 5 percent cobblestones; neutral; gradual, smooth boundary.
B1—6 to 14 inches, light reddish brown (5YR 6/4) gravelly sandy clay loam, reddish brown (5YR 4/4) moist; weak, very fine and fine, subangular blocky structure; slightly hard, friable, slightly sticky; common very fine and fine and few medium roots; many very fine and fine tubular pores; 20 percent gravel and 5 percent cobblestones; slightly acid; clear, smooth boundary.
B2t—14 to 26 inches, reddish brown (5YR 4/3) clay, reddish brown (5YR 4/4) moist; strong, medium and coarse, blocky structure; hard, very firm, sticky and plastic; few very fine and fine and common medium roots; common very fine and fine and few medium tubular pores; many moderately thick clay films on ped faces; slightly acid; gradual, smooth boundary.
B3t—26 to 41 inches, reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; weak, fine and medium, angular blocky structure; hard, very firm, sticky and plastic; few fine and common medium roots; many very fine and fine tubular pores; few moderately thick clay films on ped faces; slightly acid; gradual, smooth boundary.
C1—41 to 60 inches, yellowish red (5YR 5/6) clay, yellowish red (5YR 4/6) moist; massive; hard, very firm, sticky and plastic; few fine and medium roots; common very fine interstitial pores; neutral.

The A1 horizon has hue of 7.5YR to 10YR, value of 3 to 5 dry and 2 or 3 moist, and chroma of 2 or 3. It is gravelly loam, silt loam, very fine sandy loam, or fine sandy loam. It is 20 to 60 percent rock fragments. Reaction is slightly acid or neutral. The B1 horizon has hue of 5YR to 7.5YR, value of 5 or 6 dry and 3 or 4 moist, and chroma of 2 to 4. It is loam or gravelly sandy clay loam. The content of rock fragments is 10 to 35 percent. The Bt horizon has hue of 2.5YR to 5YR, value of 4 to 6 dry and 3 or 4 moist, and chroma of 3 or 4. It is clay or silty clay.

BUE—Burnac gravelly loam, 20 to 60 percent slopes. This moderately steep to very steep soil is in mountainous areas in the Cibola National Forest. Included in mapping are areas of Sandia and Kolob soils, which make up about 20 percent of the unit. Also included are areas of a soil that is similar to Burnac soils but is 35 to 50 percent rock fragments and a few areas of a soil that is yellower than is typical of the series. These included soils make up 10 percent of the unit.

Runoff is rapid, and the hazard of water erosion is severe.

This soil is used for timber, range, wildlife habitat, and watershed. Dryland capability subclass VIIe; native plant community 11; timber suitability group 4.

Carlito Series

The Carlito series consists of deep, well drained soils that formed in material weathered mainly from shale on the sides of mountains. Slopes are 15 to 80 percent. The native vegetation is principally side-oats grama, black grama, blue grama, bottlebrush squirreltail, pinyon pine, oneseed juniper, and alligator juniper. Elevations range from 6,500 to 7,500 feet. The mean annual precipitation is 10 to 14 inches, the mean annual air temperature is 47° to 54° F, and the frost-free season is 130 to 160 days. Carlito soils are associated with Burnac and Seis soils.

In a representative profile, the surface layer is reddish brown stony loam about 4 inches thick. The subsoil is reddish brown clay and silty clay about 30 inches thick. The substratum to a depth of 60 inches or more is reddish brown silty clay. The soil is noncalcareous to a depth of 4 inches and is mildly alkaline to a depth of 34 inches and moderately alkaline below.

Permeability is slow. Available water capacity is 8 to 9.5 inches. Effective rooting depth is about 60 inches.

Carlito soils are used for range, wildlife habitat, recreation, and watershed.

Representative profile of Carlito stony loam, from an area of Carlito complex, 15 to 80 percent slopes, in NW¼NE¼ sec. 24, T. 10 N., R. 5 E.

A1—0 to 4 inches, reddish brown (5YR 4/3) stony loam, dark reddish brown (5YR 3/4) moist; moderate, fine and very fine, granular structure; soft, friable; 25 percent stones and cobblestones; common very fine and fine roots; many fine interstitial pores; mildly alkaline; clear, smooth boundary.
B21t—4 to 8 inches, reddish brown (5YR 4/3) clay, reddish brown (5YR 4/3) moist; strong, fine and medium, angular blocky structure; hard, firm, sticky and plastic; common very fine and fine and few medium roots; few very fine and fine tubular pores; common moderately thick clay films on ped faces; slightly calcareous with disseminated lime; mildly alkaline; clear, wavy boundary.
B22t—8 to 18 inches, reddish brown (2.5YR 4/4) clay, dark red (2.5YR 3/6) moist; strong, fine and medium, angular blocky structure; hard, firm, sticky and plastic; few very fine, fine, and medium roots; few very fine and fine tubular pores; continuous moderately thick clay films on ped faces; calcareous, with disseminated lime, mildly alkaline; clear, wavy boundary.
B3tca—18 to 34 inches, reddish brown (5YR 4/3) silty clay, dark reddish brown (5YR 3/3) moist; moderate, medium and coarse, prismatic structure parting to subangular blocky structure; hard, firm, sticky and plastic; few medium roots; few very fine and fine tubular pores; moderately calcareous with large, irregularly shaped, soft masses of lime; mildly alkaline; clear, wavy boundary.
Cca—34 to 60 inches, reddish brown (5YR 4/3) silty clay, dark reddish brown (5YR 3/3) moist; massive; hard, firm, sticky and plastic; common very fine and fine interstitial pores; mixture of weathering shale and material

from above horizon; strongly calcareous with disseminated lime; moderately alkaline.

The A horizon has chroma of 3 or 4. It is stony loam or stony clay loam. The B2t horizon has hue of 2.5YR or 5YR, value of 4 or 5 dry, and chroma of 3 or 4 moist. It is clay or silty clay. The B3 and C horizons range from noncalcareous to strongly calcareous. They are mildly alkaline or moderately alkaline.

CAF—Carlito complex, 15 to 80 percent slopes. This mapping unit is about 55 percent Carlito stony loam and 30 percent a soil that is similar to the Carlito soil but is extremely stony.

This mapping unit is on the sides of canyons in the Manzanita Mountains in the Cibola National Forest where runoff is rapid and the hazard of water erosion is severe. Stones are about 5 to 30 feet apart on the surface of the Carlito stony loam, and sandstone fragments are on 25 to 90 percent of the surface on the other soil. Slopes are mainly 50 to 80 percent.

Included in this unit in mapping are areas of Seis soils, which make up 15 percent of the unit.

This mapping unit is used for range, wildlife habitat, recreation, and watershed. Dryland capability subclass VIIe; native plant community 7.

Cut and Fill Land

Cu—Cut and fill land consists of sandy loam and very gravelly sand that has been mixed by filling for residential, industrial, and business developments. It is on high terrace breaks of the Rio Grande Valley mainly in the city of Albuquerque. It is nearly level to moderately steep; slopes are 1 to 25 percent. Elevations range from 4,900 to 6,000 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 165 to 195 days.

Included in this unit in mapping are a few areas of Bluepoint, Kokan, and Wink soils.

Runoff is slow to very rapid, and the hazard of erosion is slight to severe.

Cut and fill land is used for community development and watershed. Dryland capability subclass VIIe.

Embudo Series

The Embudo series consists of deep, well drained soils that formed in alluvium derived from decomposed, coarse grained, granitic rocks on old alluvial fans. Slopes are 0 to 5 percent. The native vegetation is principally mesa dropseed, blue grama, black grama, and some cholla cactus. Elevations range from 5,000 to 6,500 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 170 to 195 days. Embudo soils are associated with Tijeras and Wink soils.

In a representative profile, the surface layer is brown gravelly fine sandy loam about 4 inches thick (fig. 4). Next is about 16 inches of brown and light brownish gray gravelly sandy loam. Below this to a depth of 60 inches or more is stratified, pale brown gravelly loamy coarse sand. The soil is moderately alkaline.

Permeability is moderate in the upper 20 inches and very rapid below. Available water capacity is 3 or 4 inches. Effective rooting depth is 60 inches or more.

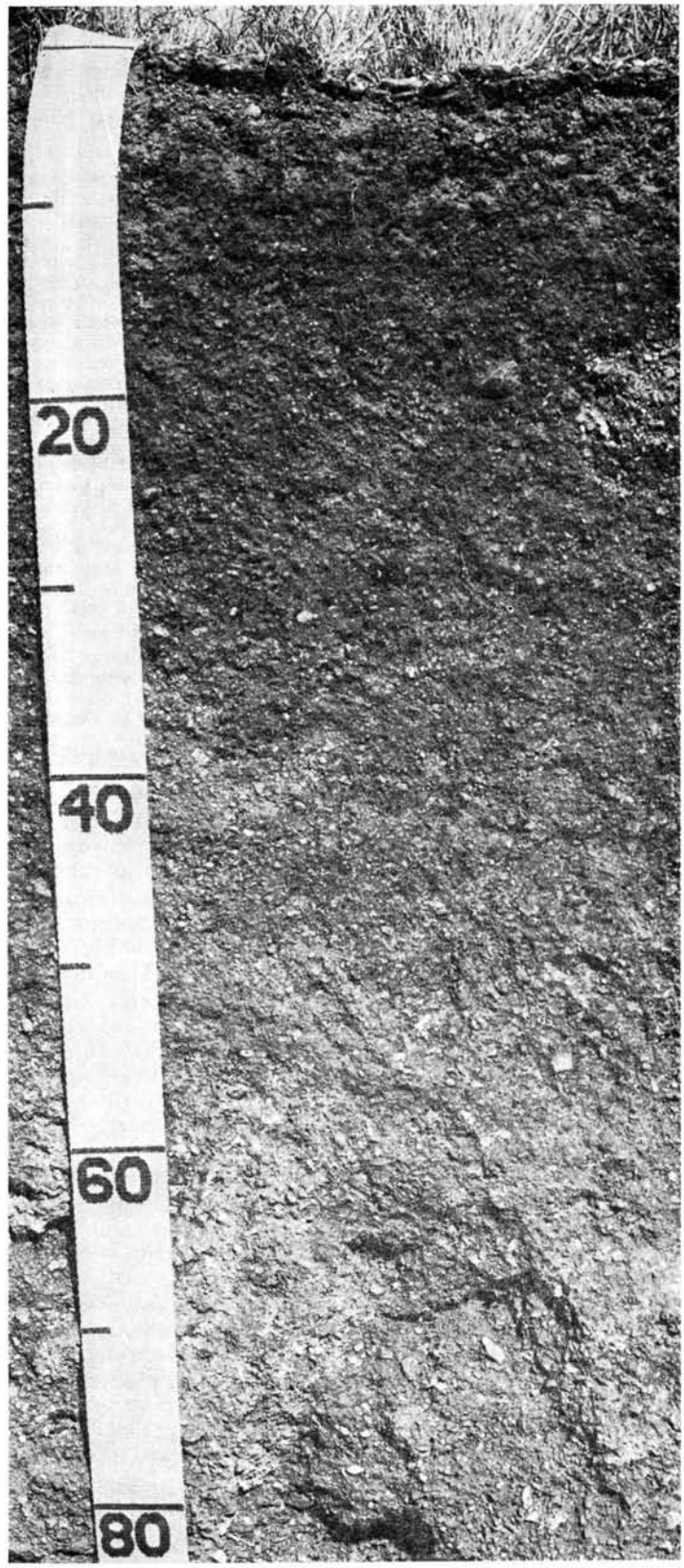

Figure 4.—**Profile of Embudo gravelly fine sandy loam, 0 to 5 percent slopes.**

Embudo soils are used for community development, watershed, range, and wildlife habitat.

Representative profile of Embudo gravelly fine sandy loam, 0 to 5 percent slopes, 50 feet north and 100 feet east of the junction of Moon and Signal Streets, Elena Gallegos Grant, in N½ sec. 17, T. 11 N., R. 4 E.

A1—0 to 4 inches, brown (10YR 5/3) gravelly fine sandy loam, dark brown (10YR 3/3) moist; weak, fine, granular structure in the upper 2 inches and moderate, fine, granular structure in the lower 2 inches; soft, very friable; many fine roots and tubular pores; 15 percent fine gravel; moderately alkaline; abrupt, smooth boundary.

AC—4 to 12 inches, brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; weak, medium, subangular blocky structure; soft, friable; many fine roots; few fine tubular pores; 35 percent fine gravel; moderately alkaline; abrupt, wavy boundary.

C1ca—12 to 20 inches, light brownish gray (10YR 6/2) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable; many fine roots; few fine tubular pores; 20 percent fine gravel; strongly calcareous with carbonates on undersides of pebbles; moderately alkaline; clear, wavy boundary.

C2—20 to 60 inches, pale brown (10YR 6/3) stratified gravelly loamy coarse sand, brown (10YR 5/3) moist; single grained; loose; few very fine roots in upper part; 35 percent fine gravel; strongly calcareous with few thin carbonates on pebbles; moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 2 to 4. It is gravelly fine sandy loam or fine sandy loam. The AC horizon has value of 4 or 5 dry and 2 to 4 moist and chroma of 2 or 3. Depth to carbonates is 12 to 20 inches. The content of coarse fragments in the C2 horizon is 30 to 50 percent.

EmB—Embudo gravelly fine sandy loam, 0 to 5 percent slopes. This level to gently sloping soil is on the East Mesa. It has the profile described as representative of the series. Included in mapping are areas around Central Avenue and Tramway Road in Albuquerque where the surface layer is thick and slightly darker than is typical and the substratum is limy and cobbly. Also included are areas of Tijeras, Millett, and Tesajo soils.

Runoff is medium, and the hazard of water erosion is moderate.

This soil is used for watershed, wildlife habitat, community development, and range. It is subject to periodic flooding. Control of moisture is needed for proper compaction. Dryland capability subclass VIIe; native plant community 4.

EtC—Embudo-Tijeras complex, 0 to 9 percent slopes. This mapping unit is about 50 percent an Embudo gravelly fine sandy loam, 0 to 5 percent slopes, and about 35 percent a Tijeras gravelly fine sandy loam that has 1 to 9 percent slopes.

The Embudo soil is in drainageways and depressions, and the Tijeras soil is on low ridges in narrow undulations. The Tijeras soil has the profile described as representative of the Tijeras series. On both soils, runoff is medium and the hazard of water erosion is moderate.

Included in this unit in mapping are areas of Tesajo, Millett, and Wink soils, which make up about 15 percent of the unit.

This mapping unit is used for community development, watershed, wildlife habitat, and range. The Embudo part of this unit is subject to flooding. Control of moisture is required for proper compaction. Dryland capability subclass VIIe; native plant community 4.

Escabosa Series

The Escabosa series consists of moderately deep, well drained soils that formed in residuum weathered from limestone bedrock on mountain foothills. Slopes are 5 to 25 percent. The native vegetation is principally blue grama, pinyon pine, oneseed juniper, and agave species. Elevations range from 6,500 to 8,000 feet. The mean annual precipitation is 10 to 14 inches, the mean annual air temperature is about 52° to 55° F, and the frost-free season is 110 to 160 days. Escabosa soils are associated with Manzano, Witt, and Laporte soils.

In a representative profile, the surface layer is dark grayish brown loam about 6 inches thick. The subsoil is dark grayish brown loam about 9 inches thick. The substratum is white gravelly loam about 8 inches thick. Limestone bedrock is at a depth of 23 inches. The soil is calcareous and moderately alkaline.

Permeability is moderate. Available water capacity is 3.5 to 4 inches. Effective rooting depth is 20 to 40 inches.

Escabosa soils are used for range, wildlife habitat, watershed, and community development.

In this survey area, Escabosa soils are mapped only with Laporte soils and Rock outcrop.

Representative profile of Escabosa loam, from an area of Laporte-Rock outcrop-Escabosa complex, 5 to 20 percent slopes, in the northwest corner of sec. 22, T. 9 N., R. 7 E.

A1—0 to 6 inches, dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak, fine, granular structure; slightly hard, friable, sticky; many very fine roots and tubular pores; slightly calcareous; moderately alkaline; clear, smooth boundary.

B2—6 to 15 inches, dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate, fine, subangular blocky structure; slightly hard, firm; many very fine roots and tubular pores; slightly calcareous; moderately alkaline; clear, smooth boundary.

Cca—15 to 23 inches, white (10YR 8/2) gravelly loam, very pale brown (10YR 8/3) moist; very hard, very firm; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

R—23 inches, limestone bedrock.

The A and B horizons have hue of 7.5YR or 10YR, value of 3 to 5 dry and 2 or 3 moist, and chroma of 2 or 3. They are loam that in places is gravelly, cobbly, or stony. The Cca horizon has hue of 7.5YR or 10YR, value of 7 to 9 dry and moist, and chroma of 2 or 3. It is gravelly loam, clay loam, or silty clay loam that is 20 to 35 percent clay. Depth to bedrock ranges from 20 to 40 inches.

Gila Series

The Gila series consists of deep, well drained soils that formed in recent alluvium on the flood plains along the Rio Grande and Rio Puerco. Slopes are 0 to 2 percent. The native vegetation is principally alkali sacaton, inland saltgrass, vine-mesquite, and fourwing saltbush. Elevations range from 4,850 to 6,000 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 165 to 185 days. Gila soils are associated with Agua, Anapra, Hantz, Vinton, and Brazito soils.

In a representative profile the surface layer is brown loam about 7 inches thick. Next is about 37 inches of stratified brown and light yellowish brown very fine sandy loam and sandy loam. Below this to a depth of 60

inches or more is pale brown sand. The soil is moderately alkaline throughout.

Permeability is moderate. Available water capacity is 8 to 11 inches. Effective rooting depth is about 60 inches.

Gila soils are used for irrigated alfalfa, row crops, and pasture. They are also used for range, wildlife habitat, watershed, and community development.

Representative profile of Gila loam, about 625 feet east of the Isleta Drain, in the northeast corner of SW¼ sec. 11, T. 9 N., R. 2 E.

Ap—0 to 7 inches, brown (7.5YR 5/4) loam, dark brown (7.5YR 4/4) moist; moderate, fine, subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common medium and fine roots; many very fine interstitial pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

C1—7 to 16 inches, brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 4/4) moist; weak, fine, granular structure; soft, very friable; many fine and very fine roots; many very fine interstitial pores; moderately calcareous; moderately alkaline; abrupt, smooth boundary.

C2—16 to 25 inches, brown (7.5YR 5/4) very fine sandy loam, dark brown (10YR 4/3) moist; weak, medium, subangular blocky structure; slightly hard, friable, slightly sticky; many fine and very fine roots; many very fine interstitial pores; moderately calcareous; moderately alkaline; abrupt, smooth boundary.

C3—25 to 32 inches, light yellowish brown (10YR 6/4) very fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky; many fine and very fine roots; common very fine tubular pores; moderately calcareous; moderately alkaline; abrupt, smooth boundary.

C4—32 to 44 inches, light yellowish brown (10YR 6/4) very fine sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable; many fine and very fine roots; common very fine tubular pores; moderately calcareous; moderately alkaline; abrupt, smooth boundary.

IIC—44 to 60 inches, pale brown (10YR 6/3) sand, brown (10YR 5/3) moist; single grained; loose; few fine roots; common very fine interstitial pores; slightly calcareous; moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6 dry and 4 or 5 moist, and chroma of 2 to 4 dry and moist. It is loam, clay loam, or silty clay loam. The C horizon has hue of 7.5YR or 10YR, value of 5 to 7 dry and 4 to 6 moist, and chroma of 3 or 4 dry and moist. It is sandy loam, very fine sandy loam, silt loam, loam, or fine sandy loam that is 10 to 18 percent clay. A seasonal water table is at a depth of 45 to 60 inches in some areas. The soil is nonsaline to slightly saline and nonalkali to moderately alkali affected.

On about 20 percent of the acreage Gila soils are 18 to 24 percent clay and are therefore finer textured than is defined as the range for the series. This difference, however, does not alter use or management. In areas of mapping unit GH west of the Rio Puerco, the mean annual temperature is a few degrees cooler than is defined as the range for the series.

GA—Gila fine sandy loam. This level or nearly level soil is in and at the mouth of the Tijeras Arroyo. It has a profile similar to that described as representative of the series, but it has lenses of 5 to 15 percent gravel and has a surface layer that differs in texture. Stream-washed sand and gravel are in the channels. Slopes are 0 to 2 percent. Included in mapping are a few small areas, near the mountains, where the surface layer is darker colored than is typical. Also included are small areas of Embudo, Bluepoint, and Glendale soils.

Runoff is slow, and flooding is a hazard. The hazards of water erosion and soil blowing are moderate.

This soil is used for wildlife habitat, watershed, and community development. Dryland capability subclass VIIe; native plant community 4.

Gb—Gila loam. This level soil is in the irrigated Rio Grande Valley. It has the profile described as representative of the series. Slopes are 0 to 1 percent. Included in mapping are small areas of Gila clay loam and fine sandy loam, areas of Brazito soils, and, along the margin of the valley floor, a few small areas of Gila loam, 1 to 3 percent slopes.

Runoff is slow, and the hazard of water erosion is slight.

This soil is used for irrigated alfalfa, row crops, and pasture. It is also used for wildlife habitat and community development. Irrigated capability unit I.

Gc—Gila loam, slightly saline. This level soil is in the irrigated Rio Grande Valley. It has a profile similar to that described as representative of the series, but it is slightly saline and has a seasonal water table at a depth of 45 to 60 inches. White crusts of salt are common on the surface, and crop failure because of salinity is common. Available water capacity is 4 to 7 inches. Slopes are 0 to 1 percent.

Included with this soil is mapping are areas of Gila clay loam, slightly saline or moderately alkali, which make up to 20 percent of the unit. Also included are small areas of Glendale and Vinton soils.

Runoff is slow, and the hazard of water erosion is slight.

This soil is used for irrigated alfalfa, row crops, and permanent pasture. It is also used for wildlife habitat and community development. Where this soil is used for community development, the failure of septic tank filter fields is a common problem because of the seasonal high water table. Irrigated capability unit IIs–5.

Gd—Gila loam, moderately alkali. This level soil is in the irrigated Rio Grande Valley. It has a profile similar to that described as representative of the series, but on about 30 percent of the acreage the surface layer is light brown, about 8 inches thick, strongly to very strongly alkaline, and more than 15 percent exchangeable sodium. Available water capacity is about 4 to 7 inches. The soil is dispersed, crusts easily, and has a moderately slow intake rate. Slopes are 0 to 1 percent. Included in mapping are areas of Armijo and Glendale soils and Gila clay loam.

Runoff is slow, and the hazard of water erosion is slight.

This soil is used for irrigated alfalfa, row crops, and pasture. It is also used for wildlife habitat and community development. Irrigated capability unit IIIs–10.

Ge—Gila clay loam. This level soil is in the irrigated Rio Grande Valley. It has a profile similar to that described as representative of the series, but the surface layer differs in texture and is about 10 inches thick. In about 1 percent of the mapped area this soil is moderately saline, and in about 0.5 percent it is moderately alkali affected. Slopes are 0 to 1 percent.

Included with this soil in mapping are small areas of a Gila soil that has a sandy clay loam surface layer and areas of Brazito fine sandy loam.

Runoff is slow, and the hazard of water erosion is slight.

This soil is used for irrigated alfalfa, row crops, and pasture. It is also used for wildlife habitat and community development. Irrigated capability unit I.

GF—Gila complex, moderately alkali. This mapping unit is 70 percent a Gila soil that has a loamy sand or sandy loam surface layer and 15 percent a Gila soil that has a sandy clay loam surface layer. These soils have profiles similar to the one described as representative of the series, but they are 15 percent gravel. Slopes are 0 to 2 percent.

This mapping unit is east of the Albuquerque Main Canal on low terraces of the Rio Grande where runoff is medium, the hazard of water erosion is moderate, and the hazard of soil blowing is severe. Windblown hummocks, 6 to 18 inches high, of loamy sand and sandy loam are in about 70 percent of the unit. Local flooding from side drainages occurs in places. On about 30 percent of the acreage the soils are strongly to very strongly alkali affected and are more than 15 percent exchangeable sodium. The soils are dispersed and crust easily.

Included in this unit in mapping are areas of Embudo, Bluepoint, and Glendale soils, which make up about 15 percent of the unit.

This mapping unit is used for community development, watershed, and wildlife habitat. Dryland capability subclass VIIe; native plant community 1.

GH—Gila-Hantz complex. This nearly level mapping unit is about 60 percent Gila silty clay loam and 35 percent Hantz silty clay loam. Slopes are 0 to 2 percent.

The Gila soil has a profile similar to that described as representative of the Gila series, but the surface layer is silty clay loam. In small areas the Hantz soil is slightly saline or moderately alkali affected, or both, and has slow permeability. On both soils, runoff is medium and the hazard of erosion is moderate or severe. On about 25 percent of the acreage the soil temperature is slightly cooler than is typical for the Gila and Hantz series.

Included in this unit in mapping are areas of Bluepoint and Penistaja soils, which make up about 5 percent of the unit.

This mapping unit is used for range, watershed, and wildlife habitat. Dryland capability subclass VIIe; native plant community 1.

Glendale Series

The Glendale series consists of deep, well drained soils that formed in stratified recent alluvium on the flood plain along the Rio Grande. Slopes are 0 to 1 percent. The native vegetation is principally alkali sacaton, inland saltgrass, vine-mesquite, and fourwing saltbush. Elevations range from 4,850 to 5,050 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 165 to 185 days. Glendale soils are associated with Gila, Vinton, Armijo, and Anapra soils.

In a representative profile, the surface layer is brown clay loam about 6 inches thick. Below this to a depth of 60 inches or more is mainly stratified light brown to gray silt loam and clay loam. The soil is mildly alkaline or moderately alkaline.

Permeability is moderately slow. Available water capacity is 11 to 12.5 inches. Effective rooting depth is 60 inches or more.

Glendale soils are used for irrigated alfalfa, row crops, and pasture. They are also used for wildlife habitat and community development.

Representative profile of Glendale clay loam, in SE¼SE¼ sec. 1, T. 9 N., R. 2 E.

Ap—0 to 6 inches, brown (7.5YR 5/2) clay loam, dark brown (7.5YR 4/2) moist; weak, fine, subangular blocky structure; hard, firm, sticky and plastic; many very fine, fine, medium, and coarse roots; many fine interstitial pores; moderately calcareous; mildly alkaline; abrupt, smooth boundary.

C1—6 to 13 inches, light brown (7.5YR 6/4) silt loam, brown (7.5YR 5/2) moist; moderate, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine, fine, medium, and coarse roots; common fine interstitial pores; moderately calcareous; moderately alkaline; abrupt, smooth boundary.

C2—13 to 16 inches, pale brown (10YR 6/3) fine sand, pale brown (10YR 6/3) moist; single grained; loose; few fine roots; many fine vesicular pores; moderately calcareous; moderately alkaline; abrupt, smooth boundary.

C3—16 to 38 inches, pinkish gray (7.5YR 6/2) silt loam, brown (7.5YR 5/2) moist; moderate, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; few fine tubular pores; moderately calcareous; moderately alkaline; abrupt, smooth boundary.

C4—38 to 46 inches, brown (7.5YR 5/2) clay, brown (7.5YR 4/2) moist; massive; very hard, firm, sticky, and plastic; few very fine roots; few fine tubular pores; moderately calcareous; mildly alkaline; abrupt, smooth boundary.

C5—46 to 60 inches, gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) moist; massive; extremely hard, firm, sticky and plastic; few very fine roots and tubular pores; moderately calcareous; moderately alkaline.

The soil is highly stratified alluvium that averages 25 to 35 percent clay. The A horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 2 to 4 dry and moist. It is loam, sandy clay loam, or clay loam and is nonsaline to slightly saline and nonalkaline to moderately alkaline. The C horizon has hue of 7.5YR or 10YR, value of 4 to 6 dry and 3 to 6 moist, and chroma of 1 to 4 dry and moist. A seasonal water table is at a depth of 45 to 60 inches in some profiles.

Gk—Glendale loam. This level soil is in the irrigated Rio Grande Valley. It has a profile similar to that described as representative of the series, but the surface layer differs in texture and is about 10 inches thick. On about 1 percent of the acreage the soil is slightly saline, and on 7 percent it is moderately alkali affected. Slopes are 0 to 1 percent. Included in mapping are a few small areas of Gila and Anapra soils.

Runoff is very slow, and the hazard of water erosion is slight.

This soil is used for irrigated alfalfa, row crops, and pasture. It is also used for wildlife habitat and community development. The failure of septic tank filter fields and the cracking of foundations can be problems where this soil is used for community development. Irrigated capability unit I.

Gm—Glendale clay loam. This level soil is in the Rio Grande Valley. It has the profile described as representative of the series. Slopes are 0 to 1 percent. Included in mapping are small areas of Glendale loam and Gila and Anapra soils.

Runoff is slow, and the hazard of water erosion is slight.

This soil is used for irrigated alfalfa, row crops, and pasture. It is also used for wildlife habitat and community development. The failure of septic tank filter fields and the cracking of foundations can be problems where this soil is used for community development. Irrigated capability unit is I.

Gs—Glendale clay loam, slightly saline. This level soil is in the irrigated Rio Grande Valley. It has a profile similar to that described as representative of the series, but it is slightly saline. White crusts of salt are common on the surface, and crop failure because of salinity is common. In most years, this soil has a seasonal water table at a depth of 45 to 60 inches. Available water capacity is 5 to 7 inches. Slopes are 0 to 1 percent. Included in mapping are a few small areas of Glendale loam and Anapra and Armijo soils.

Runoff is slow, and the hazard of water erosion is slight.

This soil is used for irrigated alfalfa, row crops, and pasture. It is also used for wildlife habitat and community development. The failure of septic tank filter fields and the cracking of foundations can be problems where this soil is used in community development. Irrigated capability unit IIs–5.

Hantz Series

The Hantz series consists of deep, well drained soils that formed in alluvium on the flood plain along the Rio Puerco and its tributaries. Slopes are 0 to 2 percent. The native vegetation is principally alkali sacaton and galleta. Elevations range from 5,000 to 6,000 feet. The mean annual precipitation is 10 to 14 inches, the mean annual air temperature is about 58° to 60° F, and the frost-free season is 165 to 180 days. Hantz soils are associated with Gila, Shingle, Kim, and Travessilla soils.

In a representative profile, the surface layer is pale brown silty clay loam about 4 inches thick. Below this to a depth of 60 inches or more is light gray and light brownish gray silty clay. The soil is moderately calcareous and strongly alkaline.

Permeability is very slow. Available water capacity is 6 to 7 inches. Effective rooting depth is 60 inches or more.

Hantz soils are used for range, wildlife habitat, and watershed.

Representative profile of Hantz silty clay loam, 1,715 feet west and 520 feet north of the southeast corner of sec. 28, T. 10 N., R. 1 W.

A1—0 to 4 inches, pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3), moist; weak, fine, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; common fine tubular pores; moderately calcareous; strongly alkaline; abrupt, smooth boundary.

C1—4 to 10 inches, light gray (10YR 7/2) silty clay, grayish brown (10YR 5/2) moist; massive; very hard, firm, very sticky and very plastic; common fine and medium roots; common very fine tubular pores; moderately calcareous; strongly alkaline; clear, smooth boundary.

C2—10 to 40 inches, light brownish gray (10YR 6/2) silty clay, brown (10YR 5/3) moist; massive; extremely hard, very firm, very sticky and very plastic; few fine and very fine roots and tubular pores; moderately calcareous; strongly alkaline; clear, wavy boundary.

C3—40 to 65 inches, light brownish gray (10YR 6/2) silty clay, grayish brown (10YR 5/2) moist; massive; extremely hard, very firm, sticky and very plastic; few fine tubular pores; moderately calcareous; strongly alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and 3 to 5 moist, and chroma of 2 to 4. It is silt loam, clay loam, or silty clay loam and is nonsaline to slightly saline and nonalkali to moderately alkali affected. The C horizon has hue of 7.5YR to 10YR, value of 5 to 7 dry and 4 to 5 moist, and chroma of 2 to 4.

In areas of mapping units GH and Ha west of the Rio Puerco, the mean annual temperature is a few degrees cooler than is defined as the range for the series. This difference, however, does not alter use or management.

Ha—Hantz silty clay loam. This soil is level or nearly level; slopes are 0 to 2 percent. In some areas in the northernmost valley of the Montano Grant the soil is slightly saline and slightly alkali affected and in some areas it has a clay loam surface layer. On about 15 percent of the acreage the soil temperature is slightly cooler than is typical for the Hantz series. Areas adjacent to major drainageways are rarely flooded, but small tributaries are frequently flooded. Included in mapping are small areas of Gila and Vinton soils.

Runoff is medium, and the hazards of water erosion and soil blowing are moderate.

This soil is used for range, watershed, and wildlife habitat. Dryland capability subclass VIIs; native plant community 1.

Ildefonso Series

The Ildefonso series consists of deep, well drained soils that formed in gravelly, stratified, calcareous alluvium on alluvial fans. Slopes are 1 to 30 percent. The native vegetation is principally black grama, blue grama, and oneseed juniper. Elevations range from 6,000 to 7,000 feet. The mean annual precipitation is 10 to 14 inches, the mean annual air temperature is 53° to 55° F, and the frost-free season is 145 to 155 days. Ildefonso soils are associated with Scholle and Witt soils.

In a representative profile, the surface layer is brown gravelly loam about 6 inches thick. Next is about 23 inches of light brown or pinkish gray gravelly sandy loam. Below this to a depth of 60 inches or more is light brown very gravelly coarse sandy loam. The soil is strongly calcareous and moderately alkaline or strongly alkaline.

Permeability is moderately rapid. Available water capacity is 3.5 to 5 inches. Effective rooting depth is 60 inches or more.

Ildefonso soils are used for range, wildlife habitat, and watershed.

Representative profile of Ildefonso gravelly loam, from an area of Scholle-Ildefonso association, in SE¼NW¼NE¼ sec. 2, T. 11 N., R. 6 E.

A1—0 to 6 inches, brown (7.5YR 4/4) gravelly loam, dark brown (7.5YR 4/3) moist; weak, medium, subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; many microinterstitial pores; 25 percent gravel and and 5 percent cobblestones; strongly calcareous; strongly alkaline; clear, wavy boundary.

AC—6 to 14 inches, light brown (7.5YR 6/4) gravelly heavy sandy loam, brown (7.5YR 5/4) moist; weak, medium, subangular blocky structure; soft, very friable, slightly sticky; common fine and medium roots; many fine interstitial pores; 45 percent gravel and 5 percent cobblestones; strongly calcareous; strongly alkaline; gradual, smooth boundary.

C1ca—14 to 29 inches, pinkish gray (7.5YR 7/2) gravelly sandy loam, brown (7.5YR 5/4) moist; massive; slightly hard, friable; few fine roots; 40 percent grave and

10 percent cobblestones; weakly cemented with soft caliche; strongly calcareous; moderately alkaline; gradual, smooth boundary.

C2ca—29 to 60 inches, light brown (7.5YR 6/4) very gravelly coarse sandy loam, brown (7.5YR 5/4) moist; massive; soft, very friable; few fine roots; 55 percent gravel and 5 percent cobblestones; strongly calcareous; moderately alkaline.

The A horizon has hue of 10YR or 7.5YR, value of 4 to 6 dry and 4 or 5 moist, and chroma of 3 or 4. It is gravelly loam or gravelly fine sandy loam. The Cca horizon has hue of 10YR or 7.5YR, value of 6 to 8 dry and 4 to 6 moist, and chroma of 2 to 4. The content of calcium carbonate is 20 to 30 percent. The content of gravel is 40 to 70 percent.

ILC—Ildefonso gravelly sandy loam, 1 to 9 percent slopes. This nearly level to moderately sloping soil is in areas near Hell Canyon Wash and west of the Manzano Mountains. It has a profile similar to that described as representative of the series, but the surface layer differs in texture. Included in mapping are small areas of Latene soils.

Runoff is medium, and the hazard of water erosion is moderate.

This soil is used for range, watershed, and wildlife habitat. Dryland capability subclass VIIe; native plant community 7.

Kim Series

The Kim series consists of deep, well drained soils that formed in alluvium weathered mainly from interbedded shale and sandstone on uplands. Slopes are 0 to 8 percent. The native vegetation is principally alkali sacaton, galleta, Russian-thistle, and annuals. Elevations range from about 5,500 to 6,000 feet. The mean annual precipitation is 10 to 14 inches, the mean annual air temperature is about 53° to 55° F, and the frost-free season is 120 to 155 days. Kim soils are associated with Shingle, Hantz, and Travessilla soils.

In a representative profile, the surface layer is light olive brown sandy loam about 3 inches thick. Next is 9 inches of light olive brown loam. Below this to a depth of 60 inches or more is light yellowish brown loam and clay loam. The soil is moderately calcareous and mildly alkaline or moderately alkaline.

Permeability is moderate. Available water capacity is 9.5 to 12 inches. Effective rooting depth is 60 inches or more.

Kim soils are used for range, wildlife habitat, and watershed.

Representative profile of Kim sandy loam, from an area of Shingle, eroded-Kim association, 20 feet north of the fence on SW¼SE¼SW¼ sec. 8, T. 11 N., R. 2 W.

A1—0 to 3 inches, light olive brown (2.5Y 5/4) sandy loam, light olive brown (2.5Y 5/4) moist; weak, thin, platy structure; soft, friable, slightly sticky; few fine roots; many very fine interstitial pores; moderately calcareous; mildly alkaline; abrupt, smooth boundary.

AC—3 to 12 inches, light olive brown (2.5Y 5/3) loam, olive brown (2.5Y 4/4) moist; massive; hard, friable, slightly sticky and slightly plastic; common fine roots and tubular pores; moderately calcareous; mildly alkaline; clear, smooth boundary.

C1—12 to 18 inches, light yellowish brown (2.5Y 6/4) light clay loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common fine tubular pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

C2—18 to 60 inches, light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine tubular pores; moderately calcareous; mildly alkaline.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 dry and 4 or 5 moist, and chroma of 3 or 4. It is sandy loam, loam, or silty clay loam. The C horizon has hue of 10YR to 5Y, value of 4 to 6 dry and 3 to 5 moist, and chroma of 2 to 4. It is loam, light clay loam, and silty clay loam. Depth to weathered interbedded sandstone and shale ranges from 40 to more than 60 inches.

KaB—Kim fine sandy loam, 1 to 8 percent slopes. This nearly level to moderately sloping soil is between drainageways and uplands west of the Rio Puerco. It has a profile similar to that described as representative of the series, but the surface layer differs in texture and is about 5 inches thick. In some areas, gullies have formed. Included in mapping are small areas of Shingle and Hantz soils and Badland.

Runoff is medium, and the hazard of water erosion is severe.

This soil is used for range, watershed, and wildlife habitat. Dryland capability subclass VIe; native plant community 9.

KbB—Kim silty clay loam, 3 to 5 percent slopes. This gently sloping soil is between drainageways and uplands west of the Rio Puerco. It has a profile similar to that described as representative of the series, but the surface layer differs in texture and is about 6 inches thick. In some areas, gullies have formed. Included in mapping are small areas of Shingle and Hantz soils and Badland.

Runoff is moderate, and the hazard of water erosion is severe.

This soil is used for range, watershed, and wildlife habitat. Dryland capability subclass VIe; native plant community 1.

KD—Kim-Badland association. This mapping unit is about 55 percent a Kim sandy loam that has 0 to 5 percent slopes and 25 percent Badland that has 12 to 40 percent slopes.

The Kim soil is between drainageways and the areas of Badland. Runoff is moderate, and the hazard of water erosion is severe. On Badland, which consists mainly of soft shale bedrock, runoff is rapid and the hazard of water erosion is severe.

Included in this unit in mapping are areas of Shingle and Hantz soils and sandstone rock outcrop, which make up 20 percent of the unit.

This mapping unit is used for range, watershed, and wildlife habitat. Dryland capability subclass VIe for Kim soil and VIIIe for Badland; native plant community 9 for Kim soil.

Kokan Series

The Kokan series consists of deep, excessively drained soils that formed in old alluvial sand and gravel of mixed sources from the Santa Fe geological formation on dissected terraces. Slopes are 10 to 45 percent. The native vegetation is broom snakeweed and blue grama. Elevations range from 4,850 to 6,000 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air tem-

perature is 58° to 60° F, and the frost-free season is 165 to 195 days. Kokan soils are associated with Bluepoint, Wink, Madurez, and Pajarito soils.

In a representative profile, the soil to a depth of 60 inches or more is very pale brown, stratified gravelly and very gravelly sand. It is slightly calcareous and mildly alkaline.

Permeability is very rapid. Available water capacity is 2 to 3 inches. Effective rooting depth is 60 inches or more.

Kokan soils are used for range, wildlife habitat, and watershed. They are also used as a source of sand and gravel.

Representative profile of Kokan gravelly sand, from an area of Bluepoint-Kokan association, hilly, in NE¼ NE¼SE¼ sec. 8, T. 9 N., R. 3 E.

C—0 to 60 inches, vary pale brown (10YR 7/3) stratified gravelly and very gravelly sand, pale brown (10YR 6/3) moist; single grained; loose; few fine roots to a depth of 15 inches; 45 to 75 percent gravel; slightly calcareous; mildly alkaline.

The C horizon has hue of 7.5YR or 10YR, value of 5 to 7 dry and 4 to 6 moist, and chroma of 2 to 4. It is gravelly sandy loam to very gravelly sand. An A1 horizon occurs in places.

West of the Rio Puerco, the annual soil temperature is a few degrees cooler than is defined as the range for the series, but this difference does not alter use or management.

KOE—Kokan gravelly sand, 10 to 40 percent slopes. This rolling to steep soil is along the west side of the Rio Puerco Valley. It has a profile similar to that described as representative of the series, but it has a thin surface layer of gravelly sandy loam.

Included with this soil in mapping are areas of Bluepoint, Pajarito, and Vinton soils, which make up 15 percent of the unit.

Runoff is slow, and the hazard of water erosion is moderate.

This soil is used for range, wildlife habitat, and watershed and as a source of sand and gravel. Dryland capability subclass VIIe; native plant community 3.

KR—Kokan-Rock outcrop association. This mapping unit is about 75 percent a Kokan gravelly sand that has 25 to 45 percent slopes and 10 percent nearly vertical basalt rock outcrop. It is at the edge of the basalt mesa breaks on the West Mesa.

The Kokan soil occurs on the lower part of the breaks where runoff is slow and the hazard of water erosion is moderate. The Rock outcrop is on the basalt cap where runoff is rapid and the hazard of water erosion is slight. Basalt boulders 3 to 4 feet in diameter cover 40 percent of the surface of this unit.

Included in this unit in mapping are small areas of Bluepoint soils.

This mapping unit is used for wildlife habitat and watershed. Dryland capability subclass VIIe for Kokan soil and VIIIs for Rock outcrop; native plant community 3 for Kokan soil.

Kolob Series

The Kolob series consists of deep, well drained soils that formed in residuum weathered from limestone on the sides on mountains. Slopes are 15 to 80 percent. The native vegetation is principally Douglas-fir, white fir, ponderosa pine, Gambel oak, oregongrape, and mountain brome. Elevations range from 8,400 to 9,500 feet. The mean annual precipitation is 18 to 25 inches, the mean annual air temperature is 43° to 45° F, and the frost-free season is 60 to 100 days. Kolob soils are associated with Sandia soils.

In a representative profile, the surface layer is dark grayish brown stony loam and stony clay loam about 13 inches thick. The subsoil is brown stony clay and very stony clay about 29 inches thick. Limestone bedrock is at a depth of 42 inches. The soil is noncalcareous and slightly acid or neutral.

Permeability is moderately slow. Available water capacity is 5 to 5.5 inches. Effective rooting depth is 40 to 60 inches.

Kolob soils are used for timber, range, recreation, watershed, and wildlife habitat.

Representative profile of Kolob stony loam, from an area of Sandia-Kolob complex, 15 to 40 percent slopes, in SW¼ sec. 5, T. 11 N., R. 5 E.

O1—½ inch to 0, litter layer of undecomposed and partly decomposed fir needles, oak leaves, twigs, and bark.

A1—0 to 3 inches, dark grayish brown (10YR 4/2) stony loam, very dark brown (10YR 2/2) moist; moderate, fine and medium, granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine interstitial pores; 10 percent stones and 5 percent gravel; neutral; clear, smooth boundary.

A3—3 to 13 inches, dark grayish brown (10YR 4/2) stony clay loam, very dark brown (10YR 2/2) moist; weak, fine and medium, subangular blocky structure; hard, firm, slightly sticky and plastic; common fine, medium and coarse roots; common very fine and fine interstitial pores; 15 percent stones, 10 percent cobblestones, and 10 percent gravel; slightly acid; clear, smooth boundary.

B21t—13 to 18 inches, brown (7.5YR 5/4) stony clay, dark brown (7.5YR 4/4) moist; ped coatings dark brown (7.5YR 3/2) dry and moist; moderate, fine, subangular blocky structure; very hard, firm, sticky and plastic; few fine and common medium and coarse roots; few very fine interstitial pores; few thin clay films; 25 percent gravel; neutral; clear, smooth boundary.

B22t—18 to 42 inches, brown (7.5YR 5/4) very stony clay, dark brown (7.5YR 4/4) moist; ped coatings dark brown (7.5YR 3/2) dry and moist; moderate, fine and medium, subangular blocky structure; very hard, very firm, sticky and plastic; few fine and many medium and coarse roots; few very fine interstitial pores; few thin clay films; 35 percent stones, 30 percent cobblestones, and 20 percent gravel; neutral; clear, irregular boundary.

R—42 inches, fractured limestone bedrock.

The A horizon has hue of 7.5YR to 10YR and value of 4 or 5 dry. The content of rock fragments is 10 to 40 percent stones, 0 to 20 percent cobblestones, and 0 to 15 percent gravel. Reaction is slightly acid to mildly alkaline. The B horizon has hue of 7.5YR to 10YR and value of 4 or 5 dry. It ranges from stony clay loam to very stony clay that is 35 to 50 percent clay. Rock fragments are 50 to 75 percent stones, 5 to 25 percent cobblestones, and 5 to 15 percent gravel. Reaction is neutral to moderately alkaline.

KS—Kolob stony loam. This moderately steep to steep soil is on the sides of mountains in the Cibola National Forest. It has a profile similar to that described as representative of the series, but depth to bedrock is about 55 inches. Slopes are 15 to 40 percent.

Included with this soil in mapping are shallow stony soils, which make up about 10 percent of the unit, and areas of the Kolob variant, which make up 5 percent.

Runoff is rapid, and the hazard of water erosion is moderate.

This soil is used for timber, range, wildlife habitat, recreation, and watershed. Dryland capability subclass VIIe; native plant community 11; timber suitability group 2.

KT—Kolob-Rock outcrop association. This mapping unit is about 55 percent Kolob stony loam and 30 percent Rock outcrop. It is on dissected mountainsides in the Cibola National Forest. Slopes are 15 to 80 percent.

The Kolob soil is on ridges between drainageways where runoff is rapid and the hazard of water erosion is moderate. The Rock outcrop is mainly limestone bedrock. Slopes are mainly 40 to 80 percent, but some are nearly vertical. Rock ledges are between the ridges and drainageways. Runoff is rapid, and the hazard of water erosion is slight.

Included in this unit in mapping are areas of Sandia soils, which make up about 10 percent of the unit, and areas of the Kolob variant, which make up 5 percent.

This mapping unit is used for watershed, wildlife habitat, range, timber, and recreation. Dryland capability subclass VIIe for Kolob soil and VIIIs for Rock outcrop; native plant community 11 and timber suitability group 2 for Kolob soil.

KU—Kolob-Sandia association. This mapping unit is 50 percent Kolob stony loam and 30 percent Sandia stony loam. It is in the Sandia Mountains in the Cibola National Forest. Slopes are 40 to 80 percent.

The Kolob soil is in areas controlled by limestone bedrock where runoff is rapid and the hazard of water erosion is severe. The Sandia soil is in areas controlled by sandstone bedrock where runoff is rapid and the hazard of water erosion is moderate to severe.

Included in this unit in mapping are areas of Burnac soils, the Kolob variant, and Rock outcrop, which make up 20 percent of the unit.

This mapping unit is used for range, wildlife habitat, watershed, recreation, and timber. Dryland capability subclass VIIe; native plant community 11; timber suitability group 4.

Kolob Variant

The Kolob variant consists of deep, well drained soils that formed in residuum weathered from limestone on the sides of mountains. Slopes are 15 to 40 percent. The native vegetation is principally Douglas-fir, white fir, Engelmann spruce, snowberry, oregongrape, mountain brome, and Kentucky bluegrass. Elevations range from 9,300 to 10,678 feet. The mean annual precipitation is 25 to 30 inches, the mean annual air temperature is 40° to 44° F, and the frost-free season is 45 to 60 days. The Kolob variant is associated with other Kolob soils and Seis soils.

In a representative profile, the surface layer is dark grayish brown stony loam and brown cobbly loam about 10 inches thick The subsoil is grayish brown cobbly clay loam, light brown very stony clay loam, and reddish yellow very stony clay about 30 inches thick. Fractured limestone bedrock is at a depth of 40 inches. The soil is noncalcareous and neutral to mildly alkaline.

Permeability is slow. Available water capacity is 3 to 4 inches. Effective rooting depth is 40 to 60 inches.

The Kolob variant is used for timber, wildlife habitat, range, watershed, and recreation.

Representative profile of Kolob stony loam, cold variant, 15 to 40 percent slopes, in NW¼SE¼ sec. 6, T. 11 N., R. 5 E.

O1&O2—2 inches to 0, litter layer of undecomposed and partly decomposed fir needles, leaves, twigs, and bark.

A11—0 to 3 inches, dark grayish brown (10YR 4/2) stony loam, very dark brown (10YR 2/2) moist; moderate, very fine and fine, granular structure; soft, friable; many very fine and fine and few medium roots; many very fine and fine interstitial pores; 10 percent stones and 10 percent cobblestones; mildly alkaline; clear, smooth boundary.

A12—3 to 10 inches, brown (10YR 5/3) cobbly loam, dark brown (10YR 3/3) moist; moderate, very fine and fine, granular structure; soft, friable; many very fine and fine tubular pores; 10 percent cobblestones; neutral; clear, smooth boundary.

B1t—10 to 13 inches, grayish brown (10YR 5/2) cobbly clay loam, dark brown (10YR 3/3) moist; moderate, very fine and fine, subangular blocky structure; slightly hard, firm, sticky and plastic; common very fine and fine and few medium roots; few very fine and fine tubular pores; 30 percent cobblestones and 10 percent gravel; mildly alkaline; gradual, smooth boundary.

B21t—13 to 23 inches, light brown (7.5YR 6/4) very stony clay loam, brown (7.5YR 4/4) moist; moderate, fine and medium, subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine and few medium roots; common very fine and fine tubular pores; 20 percent stones, 30 percent cobblestones, and 5 percent gravel; common moderately thick clay films on ped faces; mildly alkaline; gradual, wavy boundary.

B22t—23 to 40 inches, reddish yellow (7.5YR 6/6) very stony clay, strong brown (7.5YR 5/6) moist; massive; hard, firm, sticky and plastic; few very fine, fine, and medium roots; few fine interstitial pores; 90 percent stones and 5 percent cobblestones; common thin clay film bridges between stones; thin lime coatings on rock fragments; mildly alkaline; gradual, wavy boundary.

R—40 inches, fractured limestone bedrock.

Depth to bedrock is 40 to 60 inches. The content of rock fragments is 5 to 55 percent in the upper 13 inches and 40 to 95 percent below. The A horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 2 or 3. It is slightly acid to mildly alkaline. The Bt horizon has hue of 7.5YR to 10YR, value of 5 or 6 dry and 3 to 5 moist, and chroma of 2 to 6.

KVE—Kolob stony loam, cold variant, 15 to 40 percent slopes. This moderately steep to steep soil is in the Sandia Mountains in the Cibola National Forest. On about 25 percent of the acreage is a very steep soil that has many rock outcrops. Included in mapping are areas of other Kolob soils, which make up about 10 percent of the unit.

Runoff is rapid, and the hazard of water erosion is moderate.

This soil is used for timber, wildlife habitat, range, watershed, and recreation. Dryland capability subclass VIIe; native plant community 12; timber suitability group 3.

La Fonda Series

The La Fonda series consists of deep, well drained soils that formed in old alluvium derived from mixed parent

rock, mainly limestone and sandstone, on alluvial fans. Slopes are 1 to 3 percent. The native vegetation is principally western wheatgrass and blue grama. Elevations range from 6,000 to 7,000 feet. The mean annual precipitation is 10 to 14 inches, the mean annual air temperature is 50° to 53° F, and the frost-free season is 130 to 155 days. La Fonda soils are associated with Silver, Witt, Manzano, and Bond soils.

In a representative profile, the surface layer is brown loam about 4 inches thick. The subsoil is reddish brown loam about 36 inches thick. The substratum to a depth of 60 inches or more is brown clay loam. The soil is moderately alkaline.

Permeability is moderate. Available water capacity is 9 to 12 inches. Effective rooting depth is 60 inches or more.

La Fonda soils are used for community development. range, wildlife habitat, recreation, and watershed.

Representative profile of La Fonda loam, in NW¼SE¼ sec. 35, T. 11 N., R. 5 E.

A1—0 to 4 inches, brown (7.5YR 5/4) loam, dark brown (7.5YR 4/4) moist; weak, fine, granular structure; soft, very friable; many fine and very fine roots; many very fine interstitial pores; moderately alkaline; abrupt, smooth boundary.

B1—4 to 8 inches, reddish brown (5YR 5/4) loam, reddish brown (5YR 4/4) moist; weak, fine, subangular blocky structure; slightly hard, friable; many fine roots; many fine and very fine interstitial pores; moderately alkaline; clear, smooth boundary.

B21—8 to 12 inches, reddish brown (5YR 5/4) loam, reddish brown (5YR 4/4) moist; moderate, fine, subangular blocky structure; slightly hard, friable; many fine roots; common fine interstitial pores; moderately alkaline; clear, smooth boundary.

B22—12 to 23 inches, reddish brown (5YR 5/4) loam, reddish brown (5YR 4/4) moist; weak, coarse, prismatic structure parting to moderate, medium, subangular blocky structure; hard, friable; many fine roots; common fine interstitial pores; moderately alkaline; clear, smooth boundary.

B3ca—23 to 40 inches, reddish brown (5YR 5/3) loam, reddish brown (5YR 4/3) moist; moderate, medium, subangular blocky structure; hard, friable; common fine roots and pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

Cca—40 to 60 inches, brown (7.5YR 5/2) clay loam, dark brown (7.5YR 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine roots; few very fine interstitial pores; moderately calcareous; moderately alkaline.

The A horizon has hue of 7.5YR or 5YR, value of 5 or 6 dry and 3 or 4 moist, and chroma of 3 or 4. It is fine sandy loam or loam. The B horizon has hue of 2.5YR or 5YR, value of 5 or 6 dry and 3 or 4 moist, and chroma of 3 to 5. It is loam or light clay loam. The C horizon has hue of 7.5YR or 5YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 2 to 4. It is sandy loam, loam, sandy clay loam, or clay loam. The A horizon and the upper part of the B horizon is noncalcareous to moderately calcareous. The content of calcium carbonate in the lower part of the B horizon and in the C horizon is 3 to 10 percent.

La—La Fonda loam. This nearly level soil is along Highway 10, north of Tijeras Canyon. Slopes are 1 to 3 percent. Included in mapping are small areas of Manzano, Silver, and Bond soils.

Runoff is medium, and the hazard of water erosion is moderate.

This soil is used for community development, range, wildlife habitat, watershed, and recreation. Dryland capability subclass VIe; native plant community 9.

Laporte Series

The Laporte series consists of very shallow and shallow, well drained soils that formed in residuum weathered from limestone bedrock on mountain foothills. Slopes are 5 to 30 percent. The native vegetation is principally blue grama, pinyon pine, and oneseed juniper. Elevations range from 6,500 to 7,500 feet. The mean annual precipitation is 10 to 14 inches, the mean annual air temperature is about 52° to 55° F, and the frost-free season is 110 to 155 days. Laporte soils are associated with Escabosa, Silver, and Witt soils.

In a representative profile, the surface layer is dark grayish brown loam about 8 inches thick. Next is about 7 inches of grayish brown loam. Limestone bedrock is at a depth of 15 inches. The soil is strongly calcareous and moderately alkaline or strongly alkaline.

Permeability is moderate. Available water capacity is 1.5 to 4 inches. Effective rooting depth is 7 to 19 inches.

Laporte soils are used for range, wildlife habitat, watershed, and community development.

Representative profile of Laporte loam, from an area of Laporte-Rock outcrop-Escabosa complex, 5 to 20 percent slopes, in NW¼NW¼NW¼ sec. 1, T. 10 N., R. 6 E.

A1—0 to 8 inches, dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak, fine and medium, subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots and interstitial pores; strongly calcareous; moderately alkaline; clear, smooth boundary.

Cca—8 to 15 inches, grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak, fine and medium, subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots; many fine and very fine interstitial pores; 5 percent gravel; strongly calcareous; strongly alkaline; abrupt, smooth boundary.

R—15 inches, white (10YR 8/1) lime-coated fractured limestone bedrock.

The A horizon has hue of 7.5YR and 10YR, value of 3 or 4 dry and 2 or 3 moist, and chroma of 2 or 3. It is loam, gravelly loam, cobbly loam, and stony loam. The Cca horizon has hue of 7.5YR or 10YR, value of 3 to 6 dry and moist, and chroma of 2 or 3. It is loam or gravelly and cobbly heavy loam. The content of gravel ranges from 0 to 30 percent, and the content of cobbles is 0 to 5 percent.

LBE—Laporte-Rock outcrop complex, 20 to 45 percent slopes. This mapping unit is about 45 percent a Laporte loam that has 15 to 30 percent slopes and 40 percent Rock outcrop.

The Laporte soil has rapid runoff and a moderate to severe hazard of water erosion. The Rock outcrop is mainly limestone, but there are a few small areas of sand stone and granite outcrop. Runoff is rapid, and the hazard of water erosion is slight.

Included in this unit in mapping are areas of Bond, Travessilla, and Escabosa soils and a soil that is similar to Silver soils but has a darker colored surface layer. Included soils make up about 15 percent of the unit.

This mapping unit is used for watershed, wildlife habitat, range, and recreation. Dryland capability subclass VIIs; native plant community 7 for Laporte soil.

LRD—Laporte-Rock outcrop-Escabosa complex, 5 to 20 percent slopes. This mapping unit is about 35 percent a Laporte loam that has 5 to 20 percent slopes, 20 percent Rock outcrop, and 15 percent an Escabosa loam that has 5 to 20 percent slopes.

The Laporte soil has the profile described as representative of the Laporte series. Runoff and the hazard of water erosion are moderate. The Rock outcrop is mainly limestone, but some areas of sandstone outcrop are south of San Antonito. Runoff is rapid, and the hazard of water erosion is slight. The Escabosa soil has the profile described as representative of the Escabosa series. Runoff and the hazard of erosion are moderate.

Included in this unit in mapping are areas of a soil that is similar to Escabosa soils but does not have the strong lime accumulation. This included soil makes up about 10 percent of the unit. Also included are areas of Ildefonso, Manzano, Silver, and Witt soils, which make up about 20 percent of the unit.

This mapping unit is used for watershed, wildlife habitat, community development, and recreation. The shallow depth to bedrock limits community development. Dryland capability subclass VIIs; native plant community 7 for Laporte and Escabosa soils.

Latene Series

The Latene series consists of deep, well drained soils that formed in old alluvium and mixed eolian sediment on the mesas east and west of the Rio Grande. Slopes are 1 to 5 percent. The native vegetation is principally mesa dropseed, sand dropseed, blue grama, galleta, and broom snakeweed. Elevations range from 5,000 to 6,000 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is about 58° to 60° F, and the frost-free season is 170 to 195 days. Latene soils are associated with Wink and Madurez soils.

In a representative profile, the surface layer is brown sandy loam about 7 inches thick. Next is about 8 inches of pale brown sandy loam. Below this to a depth of 60 inches or more is white gravelly sandy loam. The soil is strongly calcareous and moderately alkaline.

Permeability is moderate. Available water capacity is 6 to 7 inches. Effective rooting depth is 15 to 30 inches.

Latene soils are used for range, wildlife habitat, watershed, and community development.

Representative profile of Latene sandy loam, 1 to 5 percent slopes, 50 feet east of road and 200 feet south of power line in NW¼NW¼ sec. 27, T. 11 N., R. 1 E.

A1—0 to 7 inches, brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 4/2) moist; weak, thick, platy structure in upper part and weak, medium, subangular blocky in lower part; slightly hard, very friable; many very fine and fine roots; many fine interstitial pores; strongly calcareous; moderately alkaline; clear wavy boundary.

C1—7 to 15 inches, pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; weak, medium, subangular blocky structure; hard, friable, slightly sticky; many very fine and fine roots and tubular pores; strongly calcareous; moderately alkaline; clear, wavy boundary.

C2ca—15 to 24 inches, white (10YR 8/2) gravelly sandy loam, light gray (10YR 7/2) moist; massive; very hard, very firm, slightly sticky; many very fine and fine roots; many very fine and fine interstitial and very fine tubular pores; 20 percent caliche gravel; strongly calcareous; moderately alkaline; abrupt, wavy boundary.

C3ca—24 to 60 inches, white (10YR 8/2) gravelly sandy loam, very pale brown (10YR 8/3) moist; massive; extremely hard, very firm; very few fine tubular pores; strongly calcareous, weakly cemented in part above 35 inches; moderately alkaline.

The A horizon has value of 5 or 6 dry and 4 or 5 moist and chroma of 2 to 4. It is sandy loam or loamy sand. The C1 horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 2 to 4. It ranges from loam to gravelly sandy loam. The C3ca horizon is weakly cemented between depths of about 24 and 35 inches.

LtB—Latene sandy loam, 1 to 5 percent slopes. This soil is nearly level to gently sloping. On about 10 percent of the acreage the surface layer is loamy sand, and on about 15 percent it is fine sandy loam or loam. Included in mapping are areas of Wink and Madurez soils, which make up about 15 percent of the unit.

Runoff is medium, and the hazards of water erosion and soil blowing are moderate.

This soil is used for range, watershed, wildlife habitat, and community development. Dryland capability subclass VIIe; native plant community 4.

Madurez Series

The Madurez series consists of deep, well drained soils that formed on piedmonts in old unconsolidated alluvium modified by wind. Slopes are 1 to 5 percent. The native vegetation is principally black grama, sand dropseed, Indian ricegrass, and sand sagebrush. Elevations range from 4,900 to 5,900 feet. The mean annual air temperature is 58° to 60° F, the mean annual precipitation is 7 to 10 inches, and the frost-free season is 170 to 195 days. Madurez soils are associated with Bluepoint, Latene, and Wink soils.

In a representative profile, the surface layer is a brown fine sandy loam about 4 inches thick. The subsoil is brown sandy clay loam and light brown fine sandy loam about 17 inches thick. The substratum to a depth of 60 inches or more is pink, pinkish gray, and light brown sandy loam. The soil is calcareous below a depth of 13 inches and is moderately alkaline throughout.

Permeability is moderate. Available water capacity is 7.5 to 9 inches. Effective rooting depth is 60 inches or more.

Madurez soils are used for range, watershed, wildlife habitat, and community development.

Representative profile of Madurez fine sandy loam, from an area of Madurez-Wink association, gently sloping, in NW¼SW¼SE¼NW¼ sec. 5, T. 10 N., R. 1 E.

A1—0 to 4 inches, brown (7.5YR 5/2) fine sandy loam, dark brown (7.5YR 4/2) moist; weak, fine, granular structure; soft, very friable; many very fine and fine roots and interstitial pores; moderately alkaline; abrupt, smooth boundary.

B2t—4 to 13 inches, brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; weak, coarse, subangular blocky structure; hard, friable, sticky and plastic; many very fine and fine roots and interstitial pores; moderately alkaline; clear, smooth boundary.

B3ca—13 to 21 inches, light brown (7.5YR 6/4) heavy fine sandy loam, dark brown (7.5YR 4/4) moist; weak, coarse, subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots and interstitial pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

C1ca—21 to 35 inches, pink (7.5YR 7/4) heavy sandy loam, brown (7.5YR 5/4) moist; massive; hard, friable, sticky and plastic; few very fine roots and interstitial pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

C2ca—35 to 51 inches, pinkish gray (7.5YR 7/2) sandy loam, light brown (7.5YR 6/4) moist; massive; hard,

friable, slightly sticky and slightly plastic; strongly calcareous; moderately alkaline; gradual, smooth boundary.

C3ca—51 to 60 inches, light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4) moist; massive; slightly hard, friable; moderately calcareous; moderately alkaline.

The A horizon has hue of 7.5YR or 10YR and value of 5 or 6 dry and 4 or 5 moist. It is sandy loam, fine sandy loam, gravelly fine sandy loam, or loamy fine sand. The B horizon has hue of 5YR or 7.5YR, value of 4 to 6 dry and 3 to 5 moist, and chroma of 4 to 6. It is sandy clay loam, heavy sandy loam, light clay loam, heavy fine sandy loam, or light sandy clay loam. The C horizon has hue of 7.5YR or 10YR, value of 5 to 7 dry and 4 to 6 moist, and chroma of 2 to 4. It is sandy clay loam, sandy loam, gravelly sandy loam, heavy sandy loam, or loamy fine sand. Segregated lime ranges from many threads and common soft masses to many soft masses. The calcium carbonate equivalent ranges from 15 to 25 percent in the upper part of the Cca horizon, but it commonly ranges from 10 to 18 percent in the lower part.

On about 25 percent of the acreage of mapping units MaB, MbC, and MWB, the C1ca horizon has a calcium carbonate equivalent of 8 to 15 percent, which is less than is defined as the range for the series. This difference, however, does not alter use or management.

MaB—Madurez loamy fine sand, 1 to 5 percent slopes. This gently undulating to undulating soil has a profile similar to that described as representative of the series but the surface layer differs in texture (fig. 5). Included in mapping are small areas of Madurez fine sandy loam and Latene, Wink, and Pajarito soils. Included soils make up about 10 percent of the unit.

Runoff is slow, and the hazard of soil blowing is severe.

This soil is used for range, wildlife habitat, watershed, and community development. Dryland capability subclass VIIe; native plant community 6.

MbC—Madurez-Bluepoint complex, 1 to 9 percent slopes. This mapping unit is about 45 percent Madurez loamy fine sand, 1 to 5 percent slopes, and 40 percent a Bluepoint loamy sand that has 1 to 9 percent slopes.

The gently undulating to undulating Madurez soil has a profile similar to that described as representative of the Madurez series, but the surface layer is loamy fine sand about 9 inches thick. The gently undulating to gently rolling Bluepoint soil is more hummocky than the Madurez soil. Hummocks are 2 to 5 feet high. This soil has a profile similar to that described as representative of the Bluepoint series, but the surface layer is loamy sand and buried soils occur below a depth of 3 feet in places.

Included in this unit in mapping are Wink soils, which make up about 10 percent of the unit.

On both soils, runoff is slow and the hazard of soil blowing is severe.

This mapping unit is used for range, wildlife habitat, and watershed. Dryland capability subclass VIIe; native plant community 6 for Madurez soil and 2 for Bluepoint soil.

MWA—Madurez-Wink association, gently sloping. This mapping unit is about 55 percent a Madurez fine sandy loam that has 1 to 5 percent slopes and 25 percent a Wink fine sandy loam that has 1 to 7 percent slopes. It is on the East and West Mesas.

The gently sloping Madurez soil is mainly on slightly convex piedmont fans. It has the profile described as representative of the Madurez series. The gently sloping Wink soil is on the sides of low ridges. It has a profile similar to that described as representative of the Wink series, but the surface layer is about 4 inches thick.

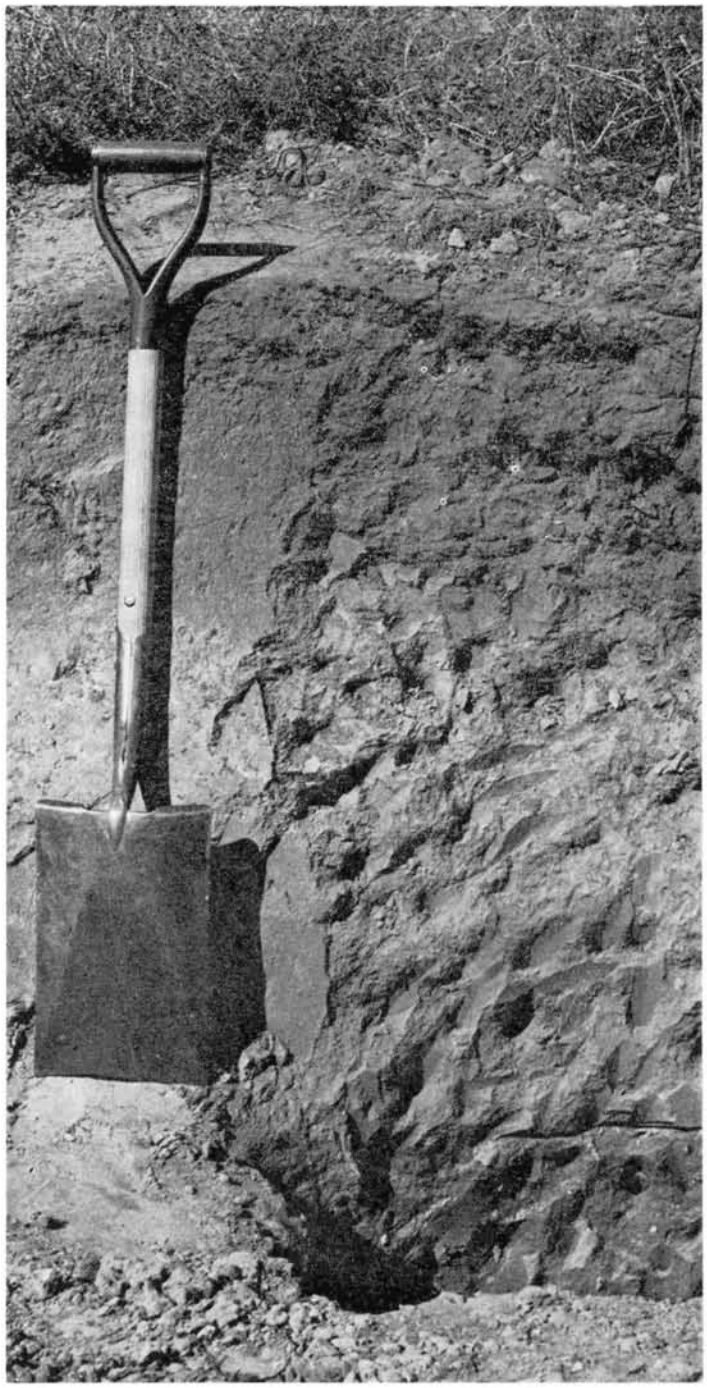

Figure 5.—**Profile of Madurez loamy fine sand. The lime accumulation at about 20 inches is a Cca horizon.**

Included in this unit in mapping are areas of Bluepoint, Pajarito, and Latene soils, which make up about 20 percent of the unit.

Runoff is slow, and the hazard of soil blowing is moderate to severe.

This mapping unit is used for range, wildlife habitat, watershed, and community development. Dryland capability subclass VIIe; native plant community 4.

MWB—Madurez-Wink association, undulating. This mapping unit is about 55 percent Madurez loamy fine sand, 1 to 5 percent slopes, and 25 percent a Wink loamy fine sand that has 1 to 7 percent slopes. It is on the piedmont fans of the East and West Mesas.

The gently undulating Madurez soil is mainly on slightly convex piedmont fans. It has a profile similar to that described as representative of the Madurez series, but the surface layer is loamy fine sand about 9 inches thick. The gently undulating to undulating Wink soil is on the sides of low ridges. It has a profile similar to that described as representative of the Wink series, but the surface layer is loamy fine sand about 7 inches thick.

Included in this unit in mapping are areas of Bluepoint and Latene soils and the Madurez-Wink association, gently sloping, which make up about 20 percent of the unit.

Runoff is slow, and the hazard of soil blowing is severe.

This mapping unit is used for range, wildlife habitat, and watershed. Dryland capability subclass VIIe; native plant community 6.

Manzano Series

The Manzano series consists of deep, well drained soils in swales. These soils formed in recent alluvium derived from mixed rocks, mainly limestone and sandstone. Slopes are 0 to 3 percent. The native vegetation is principally western wheatgrass and blue grama. Elevations range from 6,000 to 7,000 feet. The mean annual precipitation is 12 to 16 inches, the mean annual air temperature is 47° to 51° F, and the frost-free season is 120 to 155 days. Manzano soils are associated with Silver, Witt, Laporte, and Bond soils.

In a representative profile, the surface layer is brown loam about 6 inches thick. The subsoil is brown clay loam about 19 inches thick. The substratum to a depth of 60 inches or more is brown silt loam. The soil is calcareous and mildly alkaline.

Permeability is moderately slow. Available water capacity is 7 to 11 inches. Effective rooting depth is 60 inches or more.

Manzano soils are used for range, wildlife habitat, and watershed.

Representative profile of Manzano loam, in SE¼SE¼-SW¼ sec. 12, T. 10 N., R. 5 E.

A1—0 to 6 inches, brown (7.5YR 4/2) loam, dark brown (7.5YR 3/2) moist; weak, fine, granular structure; soft, very friable; many fine and very fine roots; common very fine interstitial pores; slightly calcareous; mildly alkaline; clear, smooth boundary.

B1—6 to 10 inches, brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; weak, fine, subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; common fine interstitial pores; moderately calcareous; mildly alkaline; clear, smooth boundary.

B2ca—10 to 25 inches, brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; weak, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine roots; few fine interstitial pores; strongly calcareous; lime occurs as filaments and fine mottles; mildly alkaline; abrupt, smooth boundary.

Cca—25 to 60 inches, brown (7.5YR 4/4) silt loam, brown (7.5YR 4/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; slightly calcareous; lime occurs as filaments and fine mottles; mildly alkaline.

The A horizon has hue of 5YR, 7.5YR, or 10YR, value of 3 or 4 dry and moist, and chroma of 2 or 3 dry and moist. It is loam, sandy loam, or clay loam. The B horizon has hue of 5YR to 10YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 2 to 4 dry and moist. It is loam or clay loam. In places, the C horizon is below a depth of 40 inches. It is commonly stratified with medium textured and moderately fine textured sediment.

Mz—Manzano loam. This level or nearly level soil receives runoff water from adjacent slopes. On about 10 percent of the acreage the surface layer is clay loam. Slopes are 0 to 3 percent. Included in mapping are areas of Silver and Witt soils, which make up about 10 percent of the unit, and areas of a soil that has a clay subsoil, which make up 5 percent.

Runoff is slow, and the hazard of water erosion is moderate.

This soil is used for range, watershed, and wildlife habitat. Dryland capability subclass VIe; native plant community 9.

Millett Series

The Millett series consists of deep, well drained soils that formed in granitic alluvium on old alluvial fans. Slopes are 3 to 15 percent. The native vegetation is principally black grama, blue grama, sand dropseed, juniper, small soapweed, and sacahuista. Elevations range from about 6,000 to 7,000 feet. The mean annual precipitation is 10 to 14 inches, the mean annual air temperature is 51° to 54° F, and the frost-free season is 145 to 155 days. Millett soils are associated with Embudo and Tesajo soils.

In a representative profile, the surface layer is brown stony sandy loam about 4 inches thick. The subsoil is reddish brown gravelly sandy clay loam about 6 inches thick. The substratum to a depth of 60 inches or more is brown very gravelly sandy loam and light yellowish brown very gravelly sand. The gravel and stones throughout the soil are coarse grained granitic rocks. The soil is noncalcareous to a depth of about 10 inches and is neutral or mildly alkaline.

Permeability is moderate. Available water capacity is 3 to 4 inches. Effective rooting depth is 60 inches or more.

Millett soils are used for range, wildlife habitat, recreation, watershed, and community development.

In this survey area, Millett soils are mapped only with Tesajo soils.

Representative profile of Millett stony sandy loam, from an area of Tesajo-Millett stony sandy loams, 20 feet south of the southeast corner of the intersection of Juniper Hill Road and Cedar Hill Road in SW¼NE¼ sec. 14, T. 11 N., R. 4 E.

A1—0 to 4 inches, brown (7.5YR 5/3) stony sandy loam, dark brown (7.5YR 3/2) moist; weak, thin, platy structure parting to weak, fine, granular structure; soft, very friable; about 20 percent very fine granitic gravel, 20 percent of surface covered with stones; many fine and very fine roots and interstitial pores; neutral; abrupt, smooth boundary.

B21t—4 to 10 inches, reddish brown (5YR 4/4) gravelly sandy clay loam, dark reddish brown (5YR 3/4) moist;

moderate, fine, subangular blocky structure; slightly hard, friable, sticky and plastic; common moderately thick clay films in pores; about 18 percent very fine granitic gravel; many fine and very fine roots and tubular pores; mildly alkaline; clear, smooth boundary.

C1ca—10 to 23 inches, brown (7.5YR 5/4) very gravelly sandy loam, dark brown (7.5YR 4/4) moist; massive; soft, very friable, slightly sticky; about 40 percent very fine granitic gravel; many fine and very fine roots and interstitial pores; strongly calcareous; lime is disseminated; mildly alkaline; clear, wavy boundary.

C2ca—23 to 60 inches, light yellowish brown (10YR 6/4) very gravelly sand, brown (7.5YR 5/4) moist; single grained; loose; about 50 percent very fine granitic gravel; discontinuous weakly cemented strata 1 to 2 inches thick, making up about 8 to 10 percent of the horizon; few fine and very fine interstitial pores; calcareous; lime is mostly disseminated; neutral.

The A horizon has value of 4 or 5 dry and 3 or 4 moist and chroma of 2 to 4. It ranges from sandy loam to gravelly fine sandy loam and has a few stones. The B horizon has hue of 5YR and 7.5YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 3 or 4. It ranges from sandy clay loam to gravelly clay loam that is 3 to 25 percent gravel. The C horizon has hue of 7.5YR and 10YR, value of 5 to 7 dry and 4 to 6 moist, and chroma of 3 or 4. It is gravelly loamy sand, very gravelly sand, and gravelly or very gravelly sandy loam.

Nickel Series

The Nickel series consists of deep, well drained soils that formed in gravelly, stratified, calcareous old alluvium on alluvial fans. Slopes are 5 to 30 percent. The native vegetation is principally broom snakeweed and black grama. Elevations range from about 5,200 to 5,800 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 170 to 195 days. Nickel soils are associated with Latene, Tome, and Wink soils.

In a representative profile, the surface layer is brown gravelly fine sandy loam about 3 inches thick. The underlying layers are, in sequence downward, 8 inches of light brown gravelly loam, 12 inches of pinkish gray very gravelly loam, 10 inches of light brown very gravelly loamy sand, and 27 inches or more of light brown very gravelly sandy loam. The soil is calcareous and moderately alkaline.

Permeability is moderately slow. Available water capacity is 3 to 4 inches. Effective rooting depth is 60 inches or more.

Nickel soils are used for range, wildlife habitat, and watershed. They are a potential source of gravel.

Representative profile of Nickel gravelly fine sandy loam, from an area of Nickel-Latene association in NW¼SW¼SW¼ sec. 11, T. 8 N., R. 4 E.

A1—0 to 3 inches, brown (7.5YR 5/4) gravelly fine sandy loam, dark brown (7.5YR 4/4) moist; weak, fine, granular structure; soft, very friable; many very fine roots and interstitial pores; 40 percent gravel; moderately calcareous; moderately alkaline; abrupt, smooth boundary.

AC—3 to 11 inches, light brown (7.5YR 6/4) gravelly loam, brown (7.5YR 5/4) moist; very weak, fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common fine tubular pores; 40 percent gravel; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

C1ca—11 to 23 inches, pinkish gray (7.5YR 7/2) very gravelly loam, light brown (7.5YR 6/4) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine tubular pores; 60 percent lime-coated gravel; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

C2—23 to 33 inches, light brown (7.5YR 6/4) very gravelly loamy sand, brown (7.5YR 5/4) moist; massive; soft, very friable; common very fine interstitial pores; 65 percent gravel; moderately calcareous; moderately alkaline; abrupt, smooth boundary.

C3—33 to 60 inches, light brown (7.5YR 6/4) very gravelly sandy loam, brown (7.5YR 5/4) moist; massive; soft, friable; common very fine interstitial pores; 50 percent gravel; moderately calcareous; moderately alkaline.

The A horizon has hue of 10YR or 7.5YR and value of 5 or 6 dry and 4 or 5 moist. It ranges from gravelly fine sandy loam to gravelly loam and is 15 to 40 percent gravel. The C horizons, except for the Cca horizon, are 7.5YR 5/4 or 7.5YR 6/4. They range from very gravelly loamy sand to very gravelly loam and are 35 to 75 percent gravel. The Cca horizon is 7.5YR 8/2 or 7.5YR 7/2. It ranges from very gravelly loam to very gravelly sandy loam. This horizon is weakly cemented to strongly cemented.

NL—Nickel-Latene association. This mapping unit is about 50 percent a Nickel gravelly fine sandy loam that has 5 to 30 percent slopes and 40 percent Latene sandy loam, 1 to 5 percent slopes.

The gently rolling to hilly Nickel soil is on alluvial fans. The nearly level to gently sloping Latene soil is on the upper parts of old alluvial fans.

Included in this unit in mapping are areas of limestone rock outcrop, which make up 10 percent of the unit.

Runoff is rapid, and the hazard of water erosion is moderate to severe.

This mapping unit is used for range, watershed, and wildlife habitat. The Nickel soil is a potential source of gravel. Dryland capability subclass VIIe; native plant community 3 for Nickel soil and 4 for Latene soil.

Orthids

Orthids consist of shallow to moderately deep, well drained soils that formed in residuum weathered mostly from granite and gneiss and from some schist, limestone, and sandstone on the sides of canyons and mountains. Slopes are 30 to 80 percent. The native vegetation is principally pinyon pine, oneseed juniper, mountain-mahogany, skunkbush sumac, side-oats grama, and black grama. Elevations range from 6,000 to 8,000 feet. The mean annual precipitation is 14 to 18 inches, the mean annual air temperature is 49° to 55° F, and the frost-free season is 110 to 160 days. Orthids are associated mainly with Tesajo, Millett, and Ildefonso soils and some Borolls at higher elevations.

Orthids have variable characteristics. The surface layer is light brown, pale brown, or brown stony loam or very stony loam. The underlying layers are reddish brown, brown, or strong brown very gravelly loam to very stony sandy loam. Depth to bedrock is 10 to 30 inches. The soils are noncalcareous or calcareous and mildly alkaline or moderately alkaline.

Permeability is moderate. Available water capacity is 1 inch to 6 inches. Effective rooting depth is about 10 to 30 inches.

Orthids are used for range, watershed, wildlife habitat, and recreation.

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In this survey area, Orthids are mapped only with Rock outcrop.

Otero Series

The Otero series consists of deep, well drained soils that formed in old alluvium on alluvial fans of the uplands. Slopes are 1 to 8 percent. The native vegetation is principally Indian ricegrass, galleta, and sand dropseed. Elevations range from about 5,500 to 6,000 feet. The mean annual precipitation is 10 to 14 inches, the mean annual air temperature is about 53° to 55° F, and the frost-free season is 120 to 155 days. Otero soils are associated with Penistaja, Hantz, and Travessilla soils.

In a representative profile, the surface layer is yellowish brown fine sandy loam about 3 inches thick. Next is about 23 inches of brown and yellowish brown fine sandy loam. Below this to a depth of 60 inches or more is brown loamy fine sand. The soil is mildly alkaline or moderately alkaline.

Permeability is moderately rapid. Available water capacity is 6.5 to 11.5 inches. Effective rooting depth is 60 inches or more.

Otero soils are used for range, wildlife habitat, and watershed.

Representative profile of Otero fine sandy loam, in SW¼SW¼NE¼ sec. 17, T. 10 N., R. 2 W.

A1—0 to 3 inches, yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; single grained; loose; many fine and very fine roots; common fine interstitial pores; mildly alkaline; abrupt, smooth boundary.

C1—3 to 7 inches, yellowish brown (10YR 5/4) fine sandy loam, brown (10YR 4/3) moist; very weak, medium, subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common fine interstitial pores; moderately alkaline; gradual, smooth boundary.

C2—7 to 26 inches, brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common fine interstitial pores; slightly calcareous; moderately alkaline; gradual, smooth boundary.

C3—26 to 60 inches, brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist; massive; soft, very friable; few fine and very fine roots; common fine interstitial pores; mildly alkaline.

The A horizon has hue of 7.5YR to 2.5Y, value of 5 or 6 dry and 4 or 5 moist, and chroma of 3 or 4. It ranges from fine sandy loam to loamy fine sand. The C horizon has hue of 7.5YR to 2.5Y, value of 5 to 7 dry and 4 to 6 moist, and chroma of 2 to 4. It ranges from sandy loam to loamy fine sand, but between depths of 10 and 40 inches it is, by weighted average, 12 to 18 percent clay.

OT—Otero fine sandy loam. This nearly level to moderately sloping soil is in the vicinity of the Canoncito Day School. Slopes are 1 to 8 percent. Included in mapping are areas of a soil that has a thin, weakly developed subsoil and is moderately permeable. This included soil makes up about 20 percent of the unit. Also included are small areas of Penistaja and Travessilla soils and Rock outcrop.

Runoff is slow, and the hazard of soil blowing is moderate.

This soil is used for range, watershed, and wildlife habitat. Dryland capability subclass VIIe; native plant community 9.

Pajarito Series

The Pajarito series consists of deep, well drained soils that formed in old alluvium and eolian deposits on the mesas along the Rio Grande. Slopes are 1 to 9 percent. The native vegetation is principally mesa dropseed, blue grama, and Indian ricegrass. Elevations range from 4,800 to 6,000 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 170 to 195 days. Pajarito soils are associated with Kokan, Wink, Madurez, Latene, and Bluepoint soils.

In a representative profile, the surface layer is pale brown loamy fine sand about 3 inches thick. The subsoil is light brown fine sandy loam about 39 inches thick. The substratum to a depth of 60 inches or more is pink heavy sandy loam. The soil is calcareous and moderately alkaline throughout.

Permeability is moderately rapid. Available water capacity is 8 to 9 inches. Effective rooting depth is 60 inches or more.

Pajarito soils are used for range, watershed, wildlife habitat, and community development.

Representative profile of Pajarito loamy fine sand, 1 to 9 percent slopes, on the west side of NW¼NE¼ sec. 8, T. 11 N., R. 1 E.

A1—0 to 3 inches, pale brown (10YR 6/3) loamy fine sand, brown (10YR 4/3) moist; single grained; loose; many fine and very fine roots; many very fine interstitial pores; slightly calcareous; moderately alkaline; abrupt, smooth boundary.

B21—3 to 23 inches, light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak, fine and medium, subangular blocky structure; soft, very friable; many fine and very fine roots; many very fine interstitial pores; moderately calcareous; moderately alkaline; abrupt, smooth boundary.

B22—23 to 42 inches, light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; moderate, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; many fine and very fine tubular pores; moderately calcareous; moderately alkaline; clear, wavy boundary.

C1ca—42 to 60 inches, pink (7.5YR 7/4) heavy sandy loam, brown (7.5YR 5/4) moist; massive; very hard, firm, slightly sticky and slightly plastic; few fine and very fine tubular pores; segregated carbonates lining old root channels and pores and coating large sand grains; strongly calcareous; moderately alkaline.

The A horizon has value of 5 to 7 dry and 3 to 5 moist and chroma of 2 to 4. It is loamy fine sand and fine sandy loam. The B horizon has value of 4 to 6 dry and 4 or 5 moist and chroma of 2 to 4. The C horizon has value of 6 to 8 dry and 5 to 7 moist and chroma of 3 or 4.

PAC—Pajarito loamy fine sand, 1 to 9 percent slopes. This nearly level to moderately sloping soil is on the East and West Mesas. It has the profile described as representative of the series.

Included with this soil in mapping are areas of Bluepoint, Madurez, and Wink soils. On about 30 percent of the acreage are areas where the surface layer is fine sandy loam.

Runoff is slow, and the hazard of soil blowing is severe.

This soil is used for range, watershed, wildlife habitat, and community development. Dryland capability subclass VIIe; native plant community 6.

PbB—Pajarito fine sandy loam, 1 to 5 percent slopes. This nearly level or gently sloping soil is on the West

Mesa. It has a profile similar to that described as representative of the series, but the surface layer differs in texture.

Included with this soil in mapping are small areas of Bluepoint, Madurez, and Wink soils and Pajarito loamy fine sand.

Runoff is slow, and the hazard of soil blowing is moderate.

This soil is used for range, watershed, and wildlife habitat. Dryland capability subclass VIIe; native plant community 4.

Penistaja Series

The Penistaja series consists of deep, well drained soils that formed in sandy eolian deposits over sandstone on uplands. Slopes are 1 to 5 percent. The native vegetation is principally black grama, blue grama, oneseed juniper, and pinyon pine. Elevations range from 5,400 to 7,000 feet. The mean annual precipitation is 10 to 14 inches, the mean annual air temperature is 52° to 54° F, and the frost-free season is 145 to 155 days. Penistaja soils are associated with Bond and Otero soils.

In a representative profile, the surface layer is brown fine sandy loam about 5 inches thick. The subsoil is strong brown and light brown sandy clay loam about 36 inches thick. The substratum to a depth of 60 inches or more is light brown loamy fine sand. The soil is mildly alkaline or moderately alkaline.

Permeability is moderate. Available water capacity is 8 to 9 inches. Effective rooting depth is 60 inches or more.

Penistaja soils are used for range, wildlife habitat, and watershed.

Representative profile of Penistaja fine sandy loam, 1 to 5 percent slopes, in sec. 5, T. 11 N., R. 2 W.

A1—0 to 5 inches, brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak, thin, platy structure; soft, very friable; common fine roots and interstitial pores; mildly alkaline; abrupt, smooth boundary.

B2t—5 to 17 inches, strong brown (7.5YR 5/6) sandy clay loam, dark brown (7.5YR 4/4) moist; moderate, medium, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots and interstitial pores; mildly alkaline; clear, smooth boundary.

B3ca—17 to 41 inches, light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; moderate, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine roots; common fine interstitial pores; moderately calcareous; moderately alkaline; abrupt, smooth boundary.

IIC—41 to 60 inches, light brown (7.5YR 6/4) loamy fine sand, strong brown (7.5YR 5/6) moist; single grained; loose; common fine interstitial pores; moderately calcareous; moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and 3 or 4 moist, and chroma of 3 or 4. It ranges from fine sandy loam to loamy fine sand. The B horizon has hue of 5YR or 7.5YR, value of 4 to 6 dry and 3 to 5 moist, and chroma of 3 to 6. It ranges from heavy sandy loam to clay loam, but it is mainly light sandy clay loam. The C horizon is sandy loam, loamy sand, or loamy fine sand.

On about 20 percent of the acreage of mapping units PEB and PFB, the soils are 14 to 18 percent clay and are therefore coarser textured than is defined as the range for the series. This difference, however, does not alter use or management.

PEB—Penistaja loamy fine sand, 1 to 5 percent slopes. This nearly level or gently sloping soil is west of the Rio Puerco. It has a profile similar to that described as representative of the series, but the surface layer differs in texture. Included in mapping are small areas of Silver and Otero soils and Penistaja sandy loam.

Runoff is slow, and the hazard of soil blowing is moderate or severe.

This soil is used for range, watershed, and wildlife habitat. Dryland capability subclass VIe; native plant community 6.

PFB—Penistaja fine sandy loam, 1 to 5 percent slopes. This nearly level or gently sloping soil is west of the Rio Puerco. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of a soil that is similar to this Penistaja soil but is moderately deep over sandstone bedrock. Also included are areas of Penistaja loamy fine sand and Silver soils.

Runoff is medium, and the hazard of water erosion is slight to moderate. Dryland capability subclass VIe; native plant community 9.

PG—Penistaja-Bond association. This mapping unit is about 50 percent a Penistaja sandy loam that has 1 to 5 percent slopes and 30 percent a Bond fine sandy loam that has 5 to 15 percent slopes.

The Penistaja soil is near the center of the mesa ridgetops. It has a profile similar to that described as representative of the series, but the surface layer is sandy loam. The shallower Bond soil is near the mesa breaks and rock outcrop. It has the profile described as representative of the Bond series.

Included in this unit in mapping are Otero soils, Rock outcrop, and a soil that is similar to the Penistaja soil but is moderately deep over bedrock. These inclusions make up about 20 percent of the unit.

Runoff is medium, and the hazard of water erosion is moderate.

This mapping unit is used for range, watershed, and wildlife habitat. Dryland capability subclass VIe; native plant community 9.

Pino Series

The Pino series consists of moderately deep, well drained soils that formed in material weathered from limestone and shale on the ridges and sides of mountains. Slopes are 3 to 15 percent. The native vegetation is pinyon pine, oneseed juniper, ponderosa pine, blue grama, and side-oats grama. Elevations range from 7,400 to 8,000 feet. The mean annual precipitation is 16 to 20 inches, the mean annual air temperature is 43° to 45° F, and the frost-free season is 80 to 110 days. Pino soils are associated with Laporte and Escabosa soils and Rock outcrop.

In a representative profile, the surface layer is dark grayish brown silt loam about 3 inches thick. The subsoil is dark grayish brown silty clay loam and brown silty clay about 24 inches thick. The substratum ranges from light brownish gray to light yellowish brown and is silty clay about 5 inches thick. Interbedded shale and limestone bedrock is at a depth of about 32 inches. The soil is calcareous and mildly alkaline or moderately alkaline.

Permeability is slow. Available water capacity is 5 to 5.5 inches. Effective rooting depth is 20 to 40 inches.

Pino soils are used for range, timber, recreation, watershed, and wildlife habitat.

Representative profile of Pino silt loam, from an area of Pino-Rock outcrop association, in SW¼SE¼ sec. 32, T. 8 N., R. 6 E.

A1—0 to 3 inches, dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak, fine, granular structure; soft, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine interstitial pores; slightly calcareous; mildly alkaline; clear, smooth boundary.

B1—3 to 8 inches, dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate, fine, angular blocky structure; hard, friable, sticky and plastic; common very fine roots; many very fine interstitial pores; few thin clay skins on peds; slightly calcareous; mildly alkaline; clear, smooth boundary.

B2t—8 to 17 inches, brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; moderate, medium, blocky structure; hard, friable, sticky and plastic; few very fine roots; common very fine interstitial pores; thin clay skins on peds; slightly calcareous; mildly alkaline; gradual, smooth boundary.

B3—17 to 27 inches, brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; moderate, medium, blocky structure; hard friable, sticky and plastic; few very fine roots; few very fine interstitial pores; few thin clay skins on peds; moderately calcareous with common carbonate masses and filaments; mildly alkaline; gradual, smooth boundary.

C—27 to 32 inches, variegated colors ranging from light brownish gray (10YR 6/2) to light yellowish brown (10YR 6/4) silty clay, grayish brown (10YR 5/2) to yellowish brown (10YR 5/4) moist; massive; very hard, firm, sticky and plastic; few very fine interstitial pores; moderately calcareous with common carbonate masses and filaments and partially weathered shale and limestone fragments; moderately alkaline; abrupt, smooth boundary.

R—32 inches, interbedded shale and limestone.

The A horizon has hue of 7.5YR to 10YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 2 or 3. The B horizon has hue of 5YR to 10YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 2, 3, or 4. Depth to bedrock is 20 to 40 inches.

PR—Pino-Rock outcrop association. This mapping unit is about 40 percent Pino silt loam (fig. 6) and 30 percent Rock outcrop. Slopes are 3 to 15 percent.

The Pino soil is in areas where runoff is medium and the hazard of water erosion is moderate. The Rock outcrop consists mainly of limestone, but there are some small areas of sandstone rock outcrop. Runoff is rapid, and the hazard of water erosion is slight.

Included in this unit in mapping are Escabosa and Laporte soils and, along the Torrance county line, a soil that has a layer of accumulated lime and is deeper over bedrock and generally redder than Pino soils. Each of these included soils makes up about 10 percent of the unit. In the eastern part of the survey area the soil temperature is a few degrees warmer than is typical for the Pino series.

This mapping unit is used for range, timber, recreation, wildlife habitat, and watershed. Dryland capability subclass VIe, native plant community 10, and timber suitability group 2 for Pino soil; dryland capability subclass VIIIs for Rock outcrop.

Rock Outcrop

Ra—Rock outcrop is about 90 percent rock outcrop that formed where resistant sandstone, limestone, or basalt has been exposed through faulting, uplifting, or stream channel erosion (fig. 7). It is moderately steep to very steep and is on mesa breaks, canyon walls, and sides of ridges. Slopes are 25 to 80 percent. Elevations range from 6,000 to 10,500 feet. There is little or no vegetation, except for a sparse stand of pinyon pine, oneseed juniper, shrubs, and grasses on the included soils.

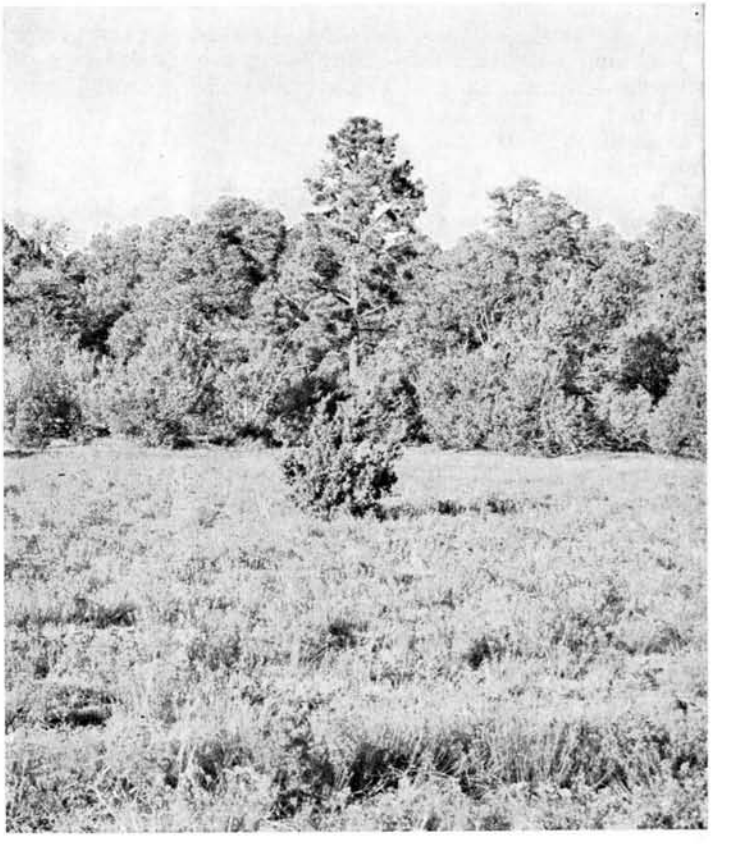

Figure 6.—Area of Pino silt loam on the Pino-Rock outcrop association. Trees are oneseed juniper, pinyon pine, and ponderosa pine.

Included in this unit in mapping are areas of a very shallow, very gravelly and stony colluvial-alluvial soil at the base of the moderately steep to very steep slopes. This included soil makes up 10 percent of the unit.

Runoff is very rapid, and the hazard of water erosion is moderate.

Rock outcrop is used for watershed, recreation, and wildlife habitat. Dryland capability subclass VIIIs.

RBE—Rock outcrop-Akela complex, 10 to 50 percent slopes, is about 45 percent Rock outcrop that has 10 to 50 percent slopes and about 40 percent an Akela stony sandy loam that has 10 to 50 percent slopes. This unit is on volcanic cinder cones on the West Mesa. The Akela soil is in areas between the rock outcrops.

Rock outcrop is basalt bedrock. Runoff is rapid, and the hazard of water erosion is slight.

Included in this unit in mapping are areas of steep to very steep Kokan and Nickel soils, which make up about 10 percent of the unit, and eroded Bluepoint soils, which make up 5 percent.

On the soils in this mapping unit, runoff is medium and the hazard of water erosion is slight to moderate.

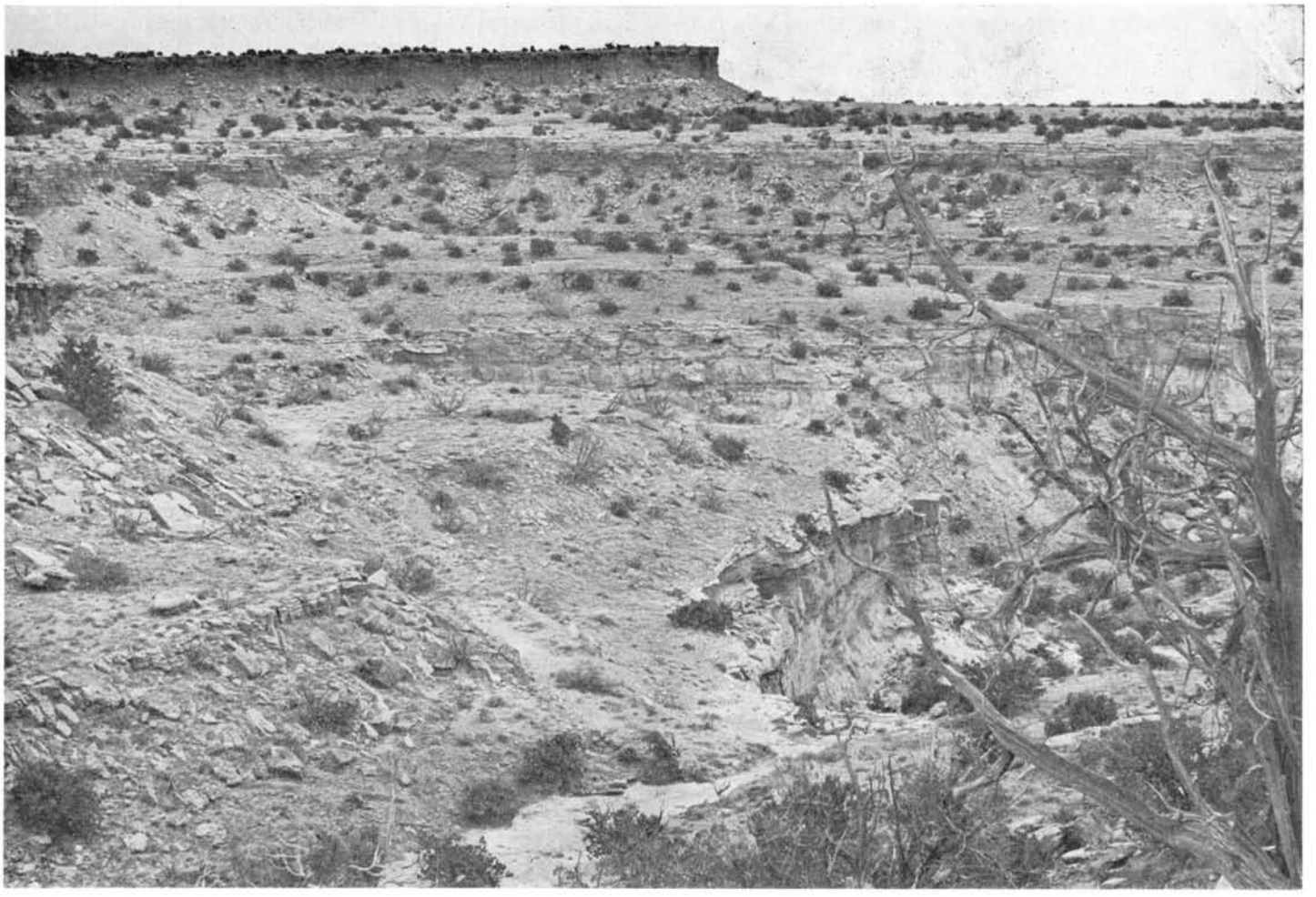

Figure 7.—Benches of sandstone rock outcrop intermingled with shallow or very shallow soils in the western part of the survey area.

This mapping unit is used for watershed, wildlife habitat, and range. Dryland capability subclass VIIIs; native plant community 8 for Akela soil.

RCE—Rock outcrop-Bond complex, 5 to 35 percent slopes, is about 40 percent Rock outcrop and 30 percent a Bond stony sandy loam that has 5 to 15 percent slopes.

Rock outcrop is mainly sandstone bedrock that is fractured in the upper 2 to 3 feet. Runoff is rapid, and the hazard of water erosion is slight.

The Bond soil has a profile similar to that described as representative of the Bond series, but the surface layer is stony sandy loam. Runoff is medium, and the hazard of water erosion is moderate to severe.

Included in this unit in mapping are areas of a soil that is similar to Travessilla soils but is redder. This soil makes up about 20 percent of the unit. Also included are areas of a soil that is similar to the Bond soil but is 35 to 45 percent clay in the subsoil. This soil makes up 10 percent of the unit.

This mapping unit is used for watershed, wildlife habitat, community development, and recreation. The shallow depth to bedrock severely limits its use in community development. Dryland capability subclass VIIIs; native plant community 7 for Bond soil.

RLF—Rock outcrop-Laporte complex, 30 to 80 percent slopes, is about 55 percent Rock outcrop and 30 percent a Laporte loam that has 20 to 45 percent slopes. This unit is on the steep sides of the Manzano Mountains on the Isleta Indian Reservation.

Rock outcrop is limestone bedrock. Runoff is rapid, and the hazard of water erosion is slight. The Laporte loam is in areas where runoff is rapid and the hazard of water erosion is moderate to severe.

Included in this unit in mapping are areas of Escabosa, Silver, and Seis soils, which make up about 15 percent of the unit.

This mapping unit is used for watershed, wildlife habitat, and range. Dryland capability subclass VIIIs; native plant community 7 and timber suitability group 5 for Laporte soil.

ROF—Rock outcrop-Orthids complex, 40 to 80 percent slopes, is about 40 percent Rock outcrop and 30 percent Orthids that have 30 to 80 percent slopes. This unit is on the west face of the Sandia and Manzanita Mountains at elevations of 6,000 to 8,000 feet.

Rock outcrop occurs where limestone, schist, gneiss, or granite has been exposed through faulting, uplifting, or geologic erosion. Runoff is very rapid, and the hazard

of water erosion is moderate. There is little or no vegetation.

Orthids are mainly in areas where bedrock is limestone, sandstone, or schist. They are mainly 10 to 30 inches deep to bedrock. On about 20 percent of the soil surface are boulders 3 to 15 feet in diameter. In some areas the subsoil is noncalcareous, and in others it has a high lime content. The soils are 40 to 70 percent stones, cobblestones, and gravel throughout the profile. Runoff is very rapid, and the hazard of water erosion is moderate.

Included in this unit in mapping are areas of shallow very stony Ustolls, which make up 20 percent of the unit, and very shallow very stony soils, which make up 10 percent.

This mapping unit is used mainly for watershed, recreation, and wildlife habitat. Dryland capability VIIIs; native plant community 7 for Orthids.

RUF—Rock outcrop-Ustolls complex, 15 to 70 percent slopes, is about 55 percent Rock outcrop and 30 percent Ustolls. This unit is on the west face of the Manzano Mountains at elevations of 6,000 to 8,000 feet.

Rock outcrop occurs where resistant schist, gneiss, granite, limestone, or sandstone has been exposed through faulting, uplifting, or geologic erosion. Runoff is rapid, and the hazard of water erosion is moderate. There is little or no vegetation.

Ustolls are shallow to deep stony or cobbly to very stony soils on steep to very steep canyon and mountain walls between the outcrops of bedrock. On 15 percent of the soil surface are boulders 3 to 15 feet in diameter. Runoff is medium, and the hazard of water erosion is moderate.

Included in this unit in mapping are areas of very shallow soils and very stony Orthids, which make up 15 percent of the unit.

This mapping unit is used for range, wildlife habitat, recreation, or watershed. Dryland capability subclass VIIIs; native plant community 7 for Ustolls.

Salas Series

The Salas series consists of moderately deep, well drained soils that formed in residuum weathered from schist on mountainsides. Slopes are 20 to 80 percent. The native vegetation is mostly black grama, blue grama, pinyon pine, and oneseed juniper. Elevations range from 6,000 to 7,100 feet. The annual precipitation is 10 to 14 inches, the annual air temperature is 50° to 55° F,. and the frost-free season is 140 to 160 days. Salas soils are associated with Millett, Seis, and Tesajo soils.

In a representative profile, the surface layer is brown very gravelly loam about 8 inches thick. The subsoil is brown gravelly clay loam and light brownish gray very gravelly fine sandy loam about 15 inches thick. The substratum is very pale brown very gravelly fine sandy loam about 11 inches thick. Schist bedrock is at a depth of about 34 inches. The soil is noncalcareous to a depth of 11 to 17 inches and is mildly alkaline to strongly alkaline.

Permeability is moderate. Available water capacity is 2.5 to 3.5 inches. Effective rooting depth is 22 to 40 inches.

Salas soils are used for wildlife habitat, watershed, and recreation.

Representative profile of Salas very gravelly loam, from an area of Salas complex, 20 to 80 percent slopes, in SW¼ sec. 7, T. 9, N., R. 5 E.

A1—0 to 8 inches, brown (10YR 4/3) very gravelly loam, dark brown (7.5YR 3/2) moist; moderate, very fine and fine, granular structure; soft, friable; many very fine and fine roots and interstitial pores; 50 percent gravel and 5 percent cobblestones; mildly alkaline; clear, smooth boundary.

B2t—8 to 16 inches, brown (7.5YR 4/4) gravelly clay loam, dark brown (7.5YR 3/4) moist; moderate, fine and medium, subangular blocky structure; slightly hard, friable, slightly sticky; many very fine and fine roots and tubular pores; 45 percent gravel and 5 percent cobblestones; mildly alkaline; gradual, smooth boundary.

B3ca—16 to 23 inches, light brownish gray (10YR 6/2) very gravelly fine sandy loam, grayish brown (10YR 5/2) moist; weak, fine and medium, subangular blocky structure; soft, friable, slightly sticky; many very fine and fine roots and tubular pores; 50 percent gravel and 5 percent cobblestones; moderately calcareous with irregular soft lime masses; moderately alkaline; gradual, smooth boundary.

Cca—23 to 34 inches, very pale brown (10YR 8/3) very gravelly fine sandy loam, light gray (10YR 7/2) moist; massive; soft, friable; few fine and medium roots; few very fine and fine interstitial pores; 65 percent gravel and 10 percent cobblestones; strongly calcareous with disseminated lime and many large irregular lime masses; strongly alkaline; clear, irregular boundary.

R—34 inches, schist bedrock.

Depth to bedrock ranges from 22 to 40 inches. Coarse fragments in the soil range from 45 to 60 percent. Reaction ranges from mildly alkaline to strongly alkaline. The A horizon has hue of 7.5YR or 10YR, value of 4 to 6 dry and 3 or 4 moist, and chroma of 2 to 4. The B2 horizon has value of 4 to 6 dry. It is gravelly sandy clay loam and gravelly clay loam. The B3ca horizon has value of 6 to 8 dry and 4 to 6 moist and chroma of 2 to 4. It is sandy clay loam and sandy loam. The Cca horizon has value of 7 or 8 moist and chroma of 1 or 2. It is very gravelly sandy clay loam, very gravelly sandy loam, or very gravelly fine sandy loam.

SAF—Salas complex, 20 to 80 percent slopes. This mapping unit is about 55 percent Salas very gravelly loam and 30 percent similar extremely stony soils. It is on the west side of the Manzanita Mountains in the Cibola National Forest.

The Salas soil is in areas where runoff is rapid and the hazard of water erosion is moderate. Slopes are mainly 20 to 60 percent. The similar extremely stony soils have stones and boulders on 25 to 75 percent of the surface. Slopes are mainly 50 to 80 percent.

Included in this unit in mapping are areas of a similar soil that is deep, a soil that has a subsoil and substratum of very gravelly clay, Laporte soils, and Rock outcrop. These inclusions make up 15 percent of the unit.

This mapping unit is used for wildlife habitat, watershed, and recreation. Dryland capability subclass VIIs; native plant community 7.

Sandia Series

The Sandia series consists of deep, well drained soils that formed in residuum weathered from sandstone on mountainsides. Slopes are 15 to 80 percent. The native vegetation is mostly Douglas-fir, white fir, ponderosa pine, Gambel oak, New Mexico locust, and mountain

brome. Elevations range from 8,400 to 9,500 feet. The mean annual precipitation is 18 to 25 inches, the mean annual air temperature is 43° to 45° F, and the frost-free season is 60 to 100 days. Sandia soils are associated with Kolob soils.

In a representative profile, the surface layer is dark gray stony loam about 10 inches thick. The subsoil is light brownish gray and light yellowish brown very stony sandy clay loam about 31 inches thick. Sandstone bedrock is at a depth of about 41 inches. The soil is noncalcareous and is neutral in reaction.

Permeability is moderate. Available water capacity is 3 to 3.5 inches. Effective rooting depth is 40 to 60 inches.

Sandia soils are used for timber, range, recreation, watershed, and wildlife habitat.

Representative profile of Sandia stony loam, from an area of Sandia-Kolob complex, 15 to 40 percent slopes, in SW¼NE¼ sec. 5, T. 11 N., R. 5 E.

O1&O2—2 inches to 0, undecomposed and partially decomposed needles, bark, and twigs.

A1—0 to 10 inches, dark gray (10YR 4/1) stony loam, black (10YR 2/1) moist; moderate, very fine and fine, granular structure; soft, very friable; many very fine roots; many fine interstitial pores; 40 percent stones, cobblestones, and gravel; neutral; gradual, wavy boundary.

B2—10 to 25 inches, light brownish gray (10YR 6/2) very stony sandy clay loam, brown (10YR 4/3) moist; weak, medium, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common coarse and medium roots; many fine interstitial pores; 40 percent stones and 20 percent cobblestones and gravel; neutral; gradual, wavy boundry.

B3—25 to 41 inches, light yellowish brown (10YR 6/4) very stony sandy clay loam, yellowish brown (10YR 5/4) moist; massive; hard, firm, slightly sticky and slightly plastic; few medium and coarse roots; many fine interstitial pores; 50 percent stones and 30 percent cobblestones and gravel; neutral; clear, wavy boundary.

R—41 inches, fractured sandstone bedrock.

Depth to bedrock ranges from 40 to 60 inches. Sandstone rock fragments in the soil range from 50 to 80 percent. The A horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 1 or 2. In some profiles there is an A12 horizon of stony loam or stony sandy loam. The Bt horizon has hue of 10YR or 7.5YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 2 to 4. It is very stony or very cobbly sandy clay loam.

SBE—Sandia-Kolob complex, 15 to 40 percent slopes. This mapping unit is 60 percent Sandia stony loam and 30 percent Kolob stony loam. It is in the Sandia Mountains in the Cibola National Forest.

The Sandia soil is on mountainsides where runoff is rapid and the hazard of water erosion is slight. It is underlain by sandstone bedrock.

The Kolob soil has the profile described as representative of the Kolob series. It is on mountainsides where runoff is rapid and the hazard of water erosion is moderate. It is underlain by mixed shale, sandstone, and limestone bedrock.

Included in this unit in mapping are areas of the Kolob variant and Rock outcrop, which make up 10 percent of the unit.

This mapping unit is used for timber, range, recreation, watershed, and wildlife habitat. Dryland capability subclass VIs; native plant community 11; timber suitability group 1.

Scholle Series

The Scholle series consists of deep, well drained soils that formed in old alluvium on piedmonts of the Sandia and Manzano Mountains. Slopes are 5 to 12 percent. The native vegetation is principally pinyon pine, oneseed juniper, blue grama, and broom snakeweed. Elevations range from 6,000 to 7,000 feet. The mean annual precipitation is 10 to 14 inches, the mean annual air temperature is about 51° to 53° F, and the frost-free season is 110 to 150 days. Scholle soils are associated with Escabosa, Bond, Ildefonso, Witt, Laporte, and Manzano soils.

In a representative profile, the surface layer is brown gravelly loam about 3 inches thick. The subsoil is dark brown gravelly clay loam about 8 inches thick. The substratum to a depth of 60 inches or more is pink gravelly loam. The soil is neutral to moderately alkaline.

Permeability is moderate. Available water capacity is 8 to 9 inches. Effective rooting depth is 60 inches or more.

Scholle soils are used for range, wildlife habitat, and watershed.

Representative profile of Scholle gravelly loam, from an area of Scholle-Ildefonso association, in SE¼SW¼NW¼ sec. 3, T. 11 N., R. 6 E.

A1—0 to 3 inches, brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 3/4) moist; weak, fine, granular structure; soft, friable; many fine roots; many fine tubular pores; 25 percent gravel; mildly alkaline; abrupt, smooth boundary.

B2t—3 to 11 inches, dark brown (7.5YR 4/4) gravelly clay loam, dark brown (7.5YR 4/4) moist; weak, medium, subangular blocky structure parting to moderate, fine, subangular blocky structure; hard, firm, plastic and sticky; common fine roots and interstitial pores; 20 percent gravel; neutral; abrupt, smooth boundary.

C1ca—11 to 23 inches, pink (7.5YR 7/4) gravelly loam, light brown (7.5YR 6/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine roots and interstitial pores; 20 percent gravel; strongly calcareous; moderately alkaline; clear, smooth boundary.

C2ca—23 to 60 inches, pink (7.5YR 7/4) gravelly loam, light brown (7.5YR 6/4) moist; massive; hard, friable; few fine roots and interstitial pores; 35 percent gravel; strongly calcareous; moderately alkaline.

The A horizon has hue of 7.5 or 10YR, value of 5 or 6 dry and 3 or 4 moist, and chroma of 2 to 4. It is gravelly loam or very gravelly loam. The B horizon has value of 4 or 5 dry and 3 or 4 moist and chroma of 3 or 4. The C horizon has hue of 7.5YR to 10YR, value of 6 to 8 dry and 5 to 7 moist, and chroma of 3 or 4.

SC—Scholle-Ildefonso association. This mapping unit is about 50 percent a Scholle gravelly loam that has 5 to 12 percent slopes and 35 percent a Ildefonso gravelly loam that has 9 to 30 percent slopes.

The Scholle soil is on narrow ridgetops where runoff is medium and the hazard of water erosion is moderate. The Ildefonso soil is on sides of ridges where runoff is rapid and the hazard of water erosion is severe. It has the profile described as representative of the Ildefonso series.

Included in this unit in mapping are small areas of Manzano, Silver, and Witt soils.

This mapping unit is used for range, wildlife habitat, watershed, and community development. Dryland capability subclass VIe; native plant community 7.

Seis Series

The Seis series consists of moderately deep, well drained soils that formed in residuum weathered from limestone on the sides of mountains. Slopes are 0 to 60 percent. The native vegetation is mostly blue grama, black grama, pinyon pine, oneseed juniper, Gambel oak, and small soapweed. Elevations range from 6,000 to 7,800 feet. The mean annual precipitation is 12 to 16 inches, the mean annual air temperature is 43° to 55° F, and the frost-free season is 130 to 160 days. Seis soils are associated with Ildefonso and Silver soils.

In a representative profile, the soil is pinkish gray very cobbly loam, very stony clay loam, and very stony light clay loam. Limestone bedrock is at a depth of about 30 inches. The soil is strongly calcareous and moderately alkaline.

Permeability is moderate. Available water capacity is 2.5 to 3 inches. Effective rooting depth is 25 to 40 inches.

Seis soils are used for recreation, wildlife habitat, range, and watershed. The limestone bedrock is quarried and used in the manufacture of cement.

Representative profile of Seis very cobbly loam, 0 to 15 percent slopes, in SE¼SW¼ sec. 27, T. 10 N., R. 5 E.

A1—0 to 7 inches, pinkish gray (7.5YR 6/2) very cobbly loam, brown (7.5YR 4/2) moist; weak, fine, granular structure; soft, friable, slightly sticky; few very fine and fine roots; many very fine and fine tubular pores; 10 percent stones and 30 percent cobblestones and gravel; strongly calcareous with disseminated lime; moderately alkaline; clear, smooth boundary.

B2ca—7 to 13 inches, pinkish gray (7.5YR 6/2) very stony clay loam, brown (7.5YR 4/2) moist; weak, fine and medium, subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; common very fine and fine and few medium and coarse roots; common very fine and fine tubular pores; 30 percent stones, 15 percent cobblestones, and 5 percent gravel; many lime pendants on the undersides of stones and cobblestones; strongly calcareous with many soft masses of lime; moderately alkaline; clear, wavy boundary.

Cca—13 to 30 inches, pinkish gray (7.5YR 7/2) very stony light clay loam, pinkish gray (7.5YR 6/2) moist; massive; hard, firm, slightly sticky; few very fine, fine, and medium roots; few very fine and fine interstitial pores; 50 percent stones, 15 percent cobblestones, and 5 percent gravel; strongly calcareous with many large, irregular, soft masses of lime; moderately alkaline; abrupt smooth boundary.

R—30 inches, fractured limestone bedrock.

Depth to bedrock ranges from 25 to 40 inches. Rock fragments range from 50 to 70 percent. The A1 horizon has hue of 7.5YR or 10YR, value of 6 or 7 dry and 4 to 6 moist, and chroma of 2 or 3. It is stony or very cobbly loam or stony or very cobbly sandy loam. In some profiles the upper 2 inches of the surface layer are crusted and vesicular. The B horizon has hue of 7.5YR or 10YR, value of 6 or 7 dry and 4 or 5 moist, and chroma of 2 or 3. It is stony or very stony clay loam or stony or very stony heavy loam. The Cca horizon has hue of 7.5YR or 10YR, value of 7 or 8 dry and 6 or 7 moist, and chroma of 2 or 3. It is very stony loam or very stony light clay loam. The content of carbonates in the Cca horizon is 40 percent or more.

SEC—Seis very cobbly loam, 0 to 15 percent slopes. This level to strongly sloping soil is on limestone hills of the Sandia and Manzanita Mountains in the Cibola National Forest. It has the profile described as representative of the series.

Included with this soil in mapping are areas of a soil that is similar to this Seis soil but is shallow over bedrock and is 30 to 35 percent coarse fragments. This included soil makes up about 15 percent of the unit. Also included are areas of Silver, Escabosa, and Ildefonso soils, which make up 15 percent of the unit.

Runoff is medium, and the hazard of water erosion is moderate.

This soil is used for range, recreation, wildlife habitat, watershed, and limestone quarrying. Dryland capability subclass VIIs, native plant community 7.

SFE—Seis stony loam, 15 to 60 percent slopes. This moderately steep to very steep soil is on limestone hills of the Sandia and Manzanita Mountains in the Cibola National Forest. It has a profile similar to that described as representative of the series, but the surface layer differs in texture.

Included with this soil in mapping are areas of Silver soils, Rock outcrop, and a soil that is similar to this Seis soil but is 30 to 35 percent coarse fragments and is shallow over bedrock. Included areas make up about 20 percent of the unit.

Runoff is rapid, and the hazard of water erosion is severe.

This soil is used for recreation, wildlife habitat, watershed, and range. Dryland capability subclass VIIe; native plant community 7.

SGE—Seis-Silver complex, 10 to 40 percent slopes. This mapping unit is 70 percent a Seis stony loam that mainly has 15 to 40 percent slopes and 20 percent a Silver very fine sandy loam that mainly has 10 to 15 percent slopes. It is east of the Manzanita Mountains in the Cibola National Forest.

The Seis soil is on sides of canyons where runoff is rapid and the hazard of water erosion is severe. The Silver soil is on the alluvial fans below the sides of canyons where runoff is medium to rapid and the hazards of water erosion and soil blowing are moderate.

Included with the Seis soil in mapping are a few areas of a similar soil that is 30 to 35 percent coarse fragments. Also mapped in this unit are areas of very stony Orthids, which make up 10 percent of the unit.

This mapping unit is used for range, wildlife habitat, and watershed. Dryland capability subclass VIIe; native plant community 7.

SHF—Seis complex, 30 to 80 percent slopes. This mapping unit is about 50 percent a Seis very stony loam that mainly has 30 to 60 percent slopes and 35 percent very stony Orthids that have 40 to 80 percent slopes. It is on limestone hills of the Sandia Mountains in the Cibola National Forest.

The Seis soil has a profile similar to that described as representative of the Seis series, but the surface layer is very stony loam. Runoff is rapid, and the hazard of water erosion is severe.

The very stony Orthids are in areas where runoff is rapid and the hazard of water erosion is moderate.

Included in this unit in mapping are areas of Ildefonso soils, Rock outcrop, and a soil that is similar to this Seis soil but the content of coarse fragments is 30 to 35 percent. These inclusions make up 15 percent of the unit.

This mapping unit is used for wildlife habitat, watershed, recreation, and range. Dryland capability subclass VIIe; native plant community 7.

Shingle Series

The Shingle series consists of shallow and very shallow, well drained soils that formed in residuum derived from shale on uplands. Slopes are 2 to 8 percent. The native vegetation is principally alkali sacaton, galleta, and sand dropseed. Elevations range from about 5,500 to 6,000 feet. The mean annual precipitation is 10 to 14 inches, the mean annual air temperature is about 53° to 55° F, and the frost-free season is 120 to 155 days. Shingle soils are associated with Kim, Hantz, and Travessilla soils.

In a representative profile, the surface layer is light olive brown clay loam about 6 inches thick. Next is 9 inches of light brownish gray silty clay loam. Siltstone and shale bedrock is at a depth of about 15 inches. The soil is moderately calcareous and moderately alkaline.

Permeability is moderate. Available water capacity is 2.5 to 3.0 inches. Effective rooting depth is 6 to 20 inches.

Shingle soils are used for range, wildlife habitat, and watershed.

Representative profile of Shingle clay loam, from an area of Shingle, eroded-Kim association, in SE¼SW¼-SE¼SW¼ sec. 8, T. 11 N., R. 2 W.

A1—0 to 6 inches, light olive brown (2.5Y 5/4) clay loam, olive brown (2.5Y 4/4) moist; weak, medium, subangular blocky structure; soft, very friable, sticky and plastic; few fine and medium roots; common fine tubular pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

C1—6 to 15 inches, light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, sticky and plastic; few fine and medium roots; common fine tubular pores; moderately calcareous; moderately alkaline; abrupt, smooth boundary.

C2—15 inches, decomposed siltstone and shale bedrock.

Depth to bedrock ranges from 6 to 20 inches. The A horizon ranges from loam to silty clay loam. The A and C horizons have value of 4 to 6 dry and 3 to 5 moist and chroma of 2 to 4 dry and moist.

SkE—Shingle-Badland complex, eroded, 2 to 40 percent slopes. This mapping unit is about 45 percent an eroded Shingle clay loam that has 2 to 8 percent slopes and 35 percent Badland that has 12 to 40 percent slopes.

The Shingle soil is on the crests and sides of small shale hills where runoff is rapid and the hazard of water erosion is severe. Sheet erosion and shallow gullies are common. Badland is mainly eroded soft shale bedrock in areas where runoff is rapid and the hazard of water erosion is severe.

Included in this unit in mapping are areas of Kim and Hantz soils, which make up about 20 percent of the unit.

This mapping unit is used for range, watershed, and wildlife habitat. Dryland capability subclass VIIe; native plant community 9 for Shingle soil.

SL—Shingle, eroded-Kim association. This mapping unit is about 50 percent an eroded Shingle clay loam that has 2 to 8 percent slopes and 40 percent a Kim sandy loam that has 0 to 5 percent slopes.

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The Shingle soil is on the crests and sides of small shale hills, mostly above the Kim soil. It has the profile described as representative of the Shingle series. Surface runoff is rapid, and the hazard of water erosion is severe. Sheet erosion and shallow gullies are common.

The level to undulating Kim soil is on uplands, generally below the Shingle soil. It has the profile described as representative of the Kim series. Runoff is moderate, and the hazard of water erosion is moderate.

Included in this unit in mapping are areas of Badland and sandstone rock outcrop, which make up about 10 percent of the unit.

This mapping unit is used for range, wildlife habitat, and watershed. Dryland capability subclass VIIe for Shingle soil and VIe for Kim soil; native plant community 9.

Silver Series

The Silver series consists of deep, well drained soils that formed in old alluvium derived from mixed, sedimentary rocks on piedmonts. Slopes are 0 to 15 percent. The native vegetation is principally blue grama, ring muhly, western wheatgrass, and scattered pinyon pine and oneseed juniper. Elevations range from 6,400 to 7,500 feet. The mean annual precipitation is 12 to 16 inches, the mean annual air temperature is about 47° to 51° F, and the frost-free season is 120 to 155 days. Silver soils are associated with Witt, Manzano, and Laporte soils.

In a representative profile, the surface layer is brown very fine sandy loam about 5 inches thick. The subsoil is brown and light brown heavy silty clay loam and brown heavy silt loam about 36 inches thick. The substratum to a depth of 60 inches or more is light brown heavy silt loam. The soil is mildly alkaline or moderately alkaline.

Permeability is slow. Available water capacity is about 11.5 to 12.5 inches if the soil is free of excess salt or alkali. Effective rooting depth is 60 inches or more.

Silver soils are used for range, wildlife habitat, watershed, and community development.

Representative profile of Silver very fine sandy loam, from an area of Silver and Witt soils, 2 to 5 percent slopes, in NE¼SE¼SE¼ sec. 26, T. 11 N., R. 6 E.

A1—0 to 5 inches, brown (7.5YR 5/3) very fine sandy loam dark brown (7.5YR 4/3) moist; weak, very fine, granular structure; soft, very friable, slightly sticky; many fine roots; many very fine interstitial pores; mildly alkaline; abrupt, smooth boundary.

B21t—5 to 18 inches, brown (7.5YR 5/4) heavy silty clay loam, dark brown (7.5YR 4/4) moist; weak, medium, prismatic structure parting to strong, fine, blocky structure; hard, firm, sticky and plastic; many very fine roots and tubular pores; few thin clay films on peds; mildly alkaline; clear, wavy boundary.

B22tca—18 to 31 inches, light brown (7.5YR 6/4) heavy silty clay loam, dark brown (7.5YR 4/4) moist; weak, medium, prismatic structure parting to strong, medium, blocky structure; hard, firm, sticky and plastic; many very fine roots and tubular pores; few thin clay films on peds; strongly calcareous, common thin segregated threads of lime; moderately alkaline; clear, wavy boundary.

B3—31 to 41 inches, brown (7.5YR 5/4) heavy silt loam, dark brown (7.5YR 4/4) moist; moderate, medium, blocky structure; slightly hard, firm, sticky and plastic; few very fine roots; many very fine tubular pores;

slightly calcareous; moderately alkaline; abrupt, smooth boundary.

C—41 to 60 inches, light brown (7.5YR 6/4) heavy silt loam, brown (7.5YR 5/4) moist; weak, coarse, blocky structure; slightly hard, friable, sticky and plastic; few very fine tubular pores; slightly calcareous; moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 2 to 4. The organic-matter content in the upper 7 inches averages less than 1 percent. The A horizon is very fine sandy loam, loam, fine sandy loam, or clay loam. The Bt horizon has hue of 7.5YR to 10YR, value of 4 to 6 dry and 3 or 4 moist, and chroma of 3 or 4. It is heavy clay loam, heavy silty clay loam, or light clay. The C horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 3 to 6 dry and moist.

SmA—Silver fine sandy loam, 0 to 2 percent slopes. This level or nearly level soil is in the northeastern part of the Canoncito Navajo Reservation. It has a profile similar to that described as representative of the series, but the surface layer differs in texture and is about 6 inches thick.

Included with this soil in mapping are small areas of Penistaja fine sandy loam and Silver fine sandy loam, slightly saline.

Runoff is slow, and the hazard of soil blowing is moderate.

This soil is used for range, watershed, and wildlife habitat. Dryland capability subclass VIe; native plant community 9.

SnA—Silver fine sandy loam, moderately alkali, 0 to 2 percent slopes. This level or nearly level soil is in the northeastern part of the Canoncito Navajo Reservation. It has a profile similar to that described as representative of the series, but the surface layer differs in texture, is about 4 inches thick, and has exchangeable cations that are more than 15 percent sodium. On about 10 percent of the acreage the surface layer is winnowed, and on about 20 percent it is eroded and the subsoil is exposed.

Included with this soil in mapping are small areas of Penistaja fine sandy loam and Silver fine sandy loam.

Runoff is slow, and the hazard of soil blowing is moderate.

This soil is used for range, watershed, and wildlife habitat. Dryland capability subclass VIs; native plant community 1.

SwB—Silver and Witt soils, 2 to 5 percent slopes. This mapping unit is 55 percent Silver very fine sandy loam and 30 percent Witt very fine sandy loam. It is east of the Sandia and Manzano Mountains.

The Silver and Witt soils have the profiles described as representative of their respective series. Runoff is medium, and the hazard of water erosion is moderate.

The Witt soil is dominant north of Interstate Highway 40, and the Silver soil is dominant south of Interstate Highway 40. The area along the Torrance and Santa Fe County lines is dominated by a soil that has a loam surface layer and a layer of accumulated lime higher in the profile than that in the Silver and Witt soils. In a few areas at the higher elevations the surface layer is gravelly loam.

Included in this unit in mapping are areas of Manzano loam; Silver and Witt soils, 5 to 9 percent slopes; and Laporte-Rock outcrop-Escabosa complex, 5 to 20 percent slopes. These included soils make up about 15 percent of the unit. Also included are small areas of a soil that is similar to Silver and Witt soils but has a subsoil of light clay.

This mapping unit is used for range, watershed, wildlife habitat, and community development. Dryland capability subclass VIe; native plant community 9.

SwC—Silver and Witt soils, 5 to 9 percent slopes. This mapping unit is 55 percent Silver very fine sandy loam and 25 percent Witt very fine sandy loam. It is in areas east of the Sandia and Manzano Mountains where runoff is rapid and the hazard of water erosion is moderate or severe.

The Witt soil is dominant north of Interstate Highway 40, and the Silver soil is dominant south of Interstate Highway 40. The area north of Interstate 40 is dominated by a soil that has a loam surface layer and a layer of accumulated lime higher in the profile than that in the Silver and Witt soils. In a few areas at the higher elevations the surface layer is gravelly loam.

Included in this unit in mapping are areas of Laporte-Rock outcrop-Escabosa complex, 5 to 20 percent slopes; Manzano loam; and Silver and Witt soils, 2 to 5 percent slopes. These included soils make up about 20 percent of the unit.

This mapping unit is used for range, watershed, wildlife habitat, and community development (fig. 8). Dryland capability subclass VIe; native plant community 9.

Tesajo Series

The Tesajo series consists of deep, well drained soils that formed in alluvium derived from decomposed, coarse

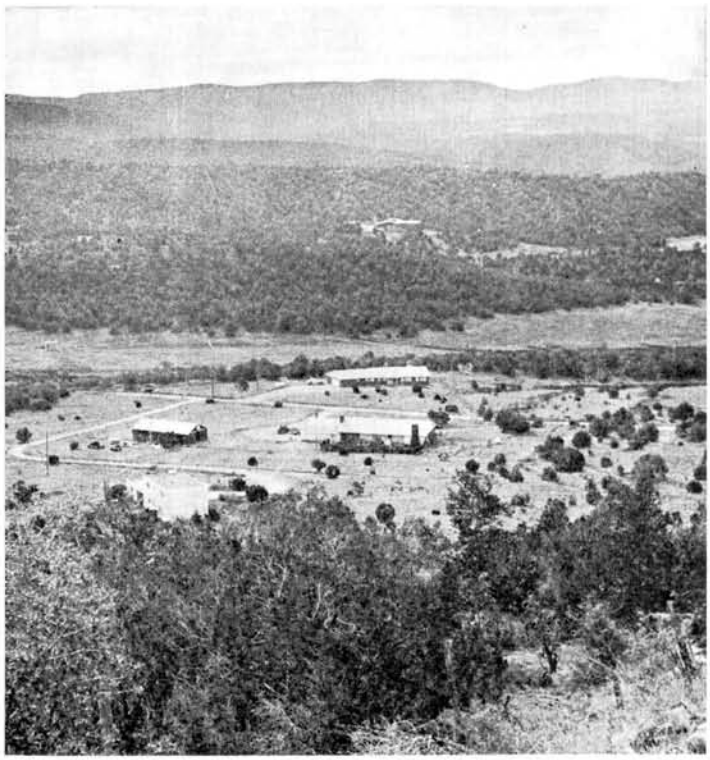

Figure 8.—**Buildings on Witt very fine sandy loam. Laporte-Rock outcrop-Escabosa complex, 5 to 20 percent slopes, is in the background.**

grained granitic rocks on alluvial fans. Slopes are 3 to 20 percent. The native vegetation is principally black grama, blue grama, sand dropseed, sacahuista, oneseed juniper, and small soapweed. Elevations range from 6,000 to 7,000 feet. The mean annual precipitation is 10 to 14 inches, the mean annual air temperature is 51° to 54° F, and the frost-free season is 145 to 185 days. Tesajo soils are associated with Millett, Embudo, and Tijeras soils.

In a representative profile, the surface layer is dark grayish brown stony sandy loam about 9 inches thick. Next is about 18 inches of dark grayish brown very gravelly loam. Below this to a depth of 60 inches or more is brown very gravelly loamy sand. The soil is noncalcareous and neutral or mildly alkaline.

Permeability is rapid. Available water capacity is 3 to 3.5 inches. Effective rooting depth is 60 inches or more.

Tesajo soils are used for range, wildlife habitat, watershed, recreation, and community development.

Representative profile of Tesajo stony sandy loam, from an area of Tesajo-Millett stony sandy loams, at the northeast corner of the intersection of Juniper Hill Road and Juniper Hill Place, in SW¼NE¼ sec. 14, T. 11 N., R. 4 E.

A1—0 to 9 inches, dark grayish brown (10YR 4/2) stony sandy loam, very dark brown (10YR 2/2) moist; weak, fine, granular structure; soft, very friable; many fine and very fine roots and interstitial pores; 20 percent covering of stones on surface; about 30 percent very fine granitic gravel; neutral; clear, smooth boundary.

AC—9 to 27 inches, dark grayish brown (10YR 4/2) very gravelly loam, very dark brown (10YR 2/2) moist; massive; soft, very friable; many fine and very fine roots and interstitial pores; about 35 percent very fine granitic gravel; mildly alkaline; abrupt, smooth boundary.

C1—27 to 60 inches, brown (10YR 4/3) very gravelly loamy sand, dark brown (10YR 3/3) moist; single grained; loose; common fine and very fine roots and interstitial pores; about 55 percent very fine granitic gravel; mildly alkaline.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 2 or 3. It is very gravelly loam or stony sandy loam. The C horizon has hue of 7.5YR or 10YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 2 or 3. It is very gravelly loamy sand modified by a few stones.

Te—Tesajo-Millett stony sandy loams. This undulating to hilly mapping unit (fig. 9) is about 40 percent a Tesajo stony sandy loam that has 3 to 20 percent slopes and 40 percent a Millett stony sandy loam that has 3 to 15 percent slopes.

The Millett soil is on ridges of alluvial fans. The Tesajo soil is in swales adjacent to the parallel to the intermittent streams and is subject to flooding. The Tesajo and Millett soils have the profiles described as representative of their respective series. Runoff is medium, and the hazard of water erosion is moderate.

Included in this unit in mapping are arroyo channels and Rock outcrop, which make up about 20 percent of the

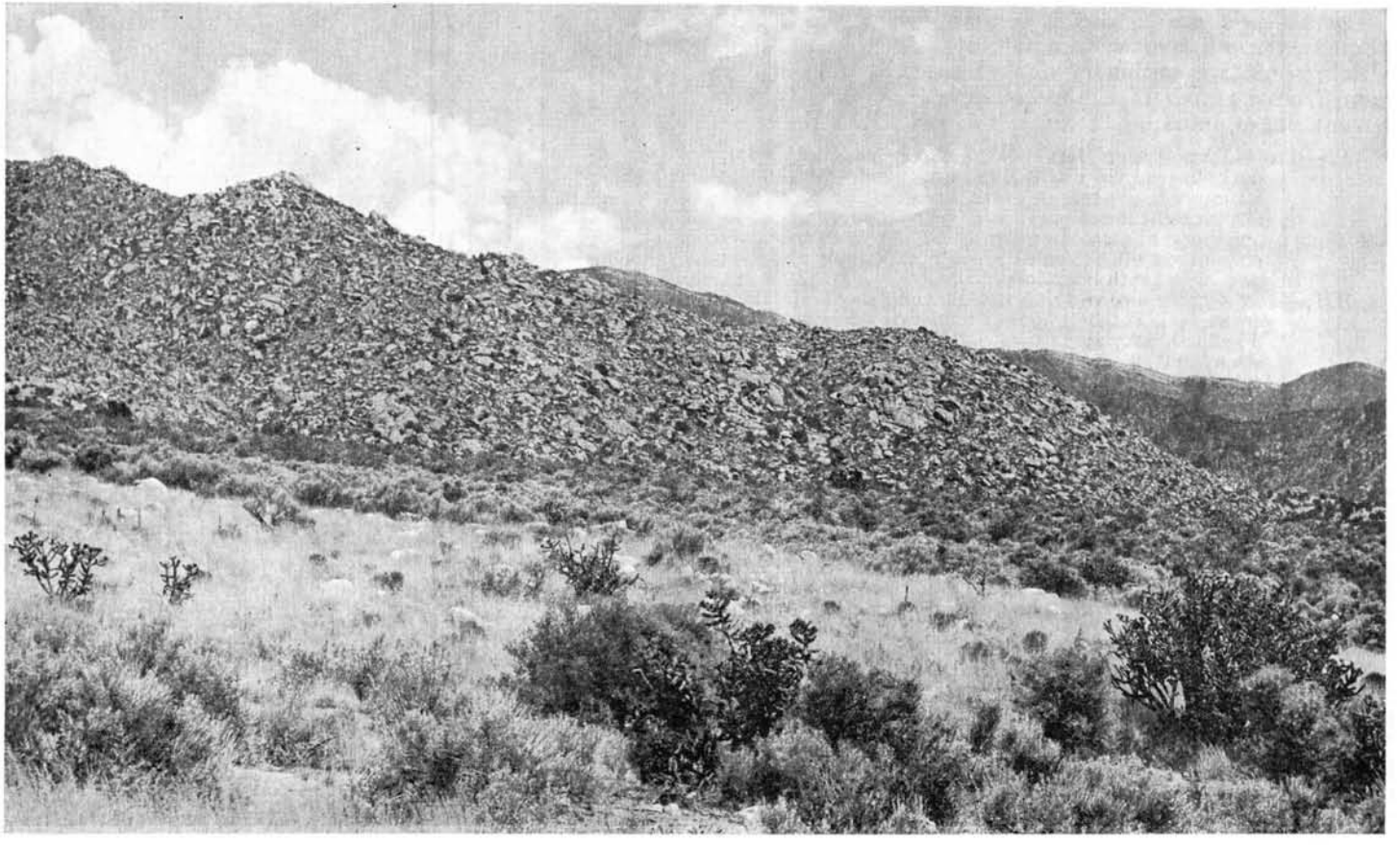

Figure 9.—An area of Tesajo-Millett stony sandy loams. In the background is Rock outcrop-Orthids complex, 40 to 80 percent slopes.

unit. About 20 percent of the surface is covered with granitic stones and boulders 1 foot to 15 feet in diameter.

This mapping unit is used for watershed, wildlife habitat, community development, and range. Dryland capability subclass VIIe; native plant community 5.

Tijeras Series

The Tijeras series consists of deep, well drained soils that formed in decomposed granitic alluvium on old alluvial fans. Slopes are 1 to 9 percent. The native vegetation is principally sand dropseed, black grama, blue grama, and some small soapweed. Elevations range from 5,000 to 6,500 feet. The mean annual precipitation is about 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 170 to 195 days. Tijeras soils are associated with Embudo, Millett, Tesajo, and Wink soils.

In a representative profile (fig. 10), the surface layer is brown gravelly fine sandy loam about 4 inches thick. The subsoil is about 15 inches of brown sandy clay loam that has some accumulation of lime in the lower part. The substratum to a depth of 60 inches or more is pale brown very gravelly loamy sand and gravelly sandy loam. The gravel is derived from granite and is fine and angular. The soil is moderately alkaline.

Permeability is moderate. Available water capacity is 3.0 to 6.5 inches. Effective rooting depth is 60 inches or more.

Tijeras soils are used for community development, range, watershed, and wildlife habitat.

Representative profile of Tijeras gravelly fine sandy loam, from an area of Embudo-Tijeras complex, 0 to 9 percent slopes, in SE¼SE¼ sec. 4, T. 10 N., R. 4 E.

A1—0 to 4 inches, brown (10YR 5/3) gravelly fine sandy loam, dark brown (10YR 3/3) moist; weak, thin, platy structure in upper ½ to 1 inch and weak, fine, granular structure in lower part; soft, very friable; many fine and very fine roots and interstitial pores; about 20 percent very fine granitic gravel; moderately alkaline; abrupt, smooth boundary.

B21t—4 to 9 inches, brown (7.5YR 4/4) sandy clay loam, dark brown (7.5YR 3/4) moist; moderate, medium, subangular blocky structure; slightly hard, very friable, sticky and plastic; many fine and very fine roots and tubular pores; many moderately thick clay films on peds and in tubular pores; about 5 percent very fine granitic gravel; moderately alkaline; clear, wavy boundary.

B22t—9 to 14 inches, brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; moderate, medium, subangular blocky structure; hard, friable, sticky and plastic; many fine and very fine roots and tubular pores; common moderately thick clay films on peds and many moderately thick clay films in tubular pores; about 5 percent very fine granitic gravel; moderately alkaline; clear, wavy boundary.

B3tca—14 to 19 inches, brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; moderate, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine roots and tubular pores; few moderately thick clay films on peds and many moderately thick clay films in tubular pores; about 12 percent very fine granitic gravel; slightly calcareous; lime is segregated as thin lime mycelium on peds and in pores; moderately alkaline; abrupt, smooth boundary.

ICca—19 to 60 inches, pale brown (10YR 6/3) strata of gravelly sandy loan and very gravelly loamy sand, brown (10YR 5/3) moist; single grained; loose; few

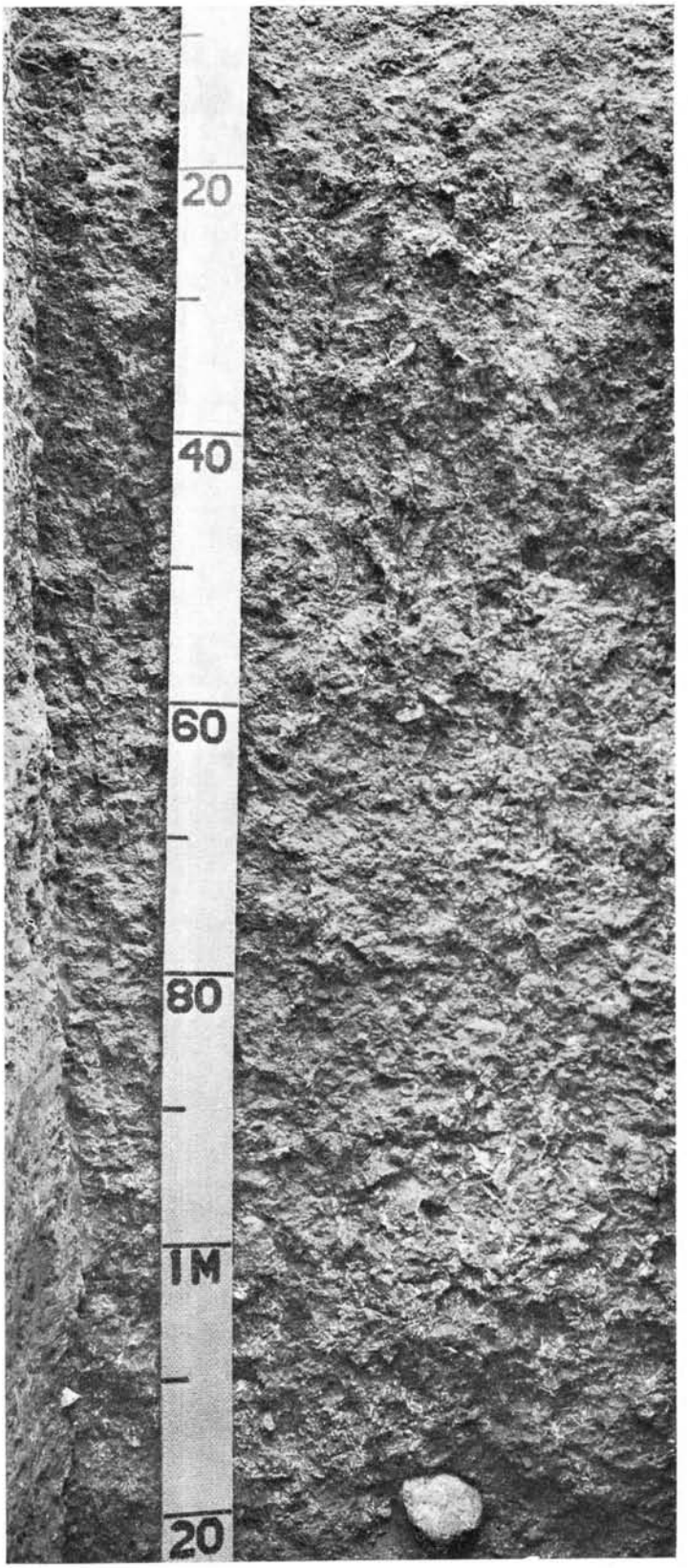

Figure 10.—**Profile of Tijeras gravelly fine sandy loam, 1 to 5 percent slopes.**

and very fine roots; many fine and very fine interstitial pores; moderately calcareous; lime is segregated as few fine soft masses; moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6 dry and 3 to 5 moist, and chroma of 2 to 4. The B horizon has hue of 5YR to 10YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 4 or 5. It is heavy sandy loam, sandy clay loam, or heavy loam that is more than 45 percent sand. The C horizon has hue of 7.5YR or 10YR. It is stratified very gravelly sandy loam and very gravelly loamy sand.

TgB—Tijeras gravelly fine sandy loam, 1 to 5 percent slopes. This nearly level to gently sloping soil is on old alluvial fans on the East Mesa. It has a profile similar to that described as representative of the series, but has a yellowish brown surface layer about 6 inches thick and has less gravel and more lime between depths of 10 and 30 inches.

Included with this soil in mapping are areas of Embudo, Madurez, and Latene soils, which make up 20 percent of the unit.

Runoff is moderate, and the hazard of water erosion is moderate.

This soil is used for community development, range, watershed, and wildlife habitat. Dryland capability subclass VIIe; native plant community 4.

Tome Series

The Tome series consists of deep, well drained soils that formed in alluvial sediments derived from limestone and shale on broad alluvial fans. Slopes are 0 to 2 percent. The native vegetation is principally black grama, alkali sacaton, blue grama, bush muhly, and galleta. Elevations range from 4,800 to 5,600 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 165 to 195 days. Tome soils are associated with Latene and Nickel soils.

In a representative profile, the surface layer is brown very fine sandy loam and silt loam about 6 inches thick. The underlying layers are, in sequence downward, 5 inches of pale brown silt loam, 16 inches of light yellowish brown heavy clay loam, 10 inches of pale brown fine sandy clay loam, and 23 inches or more of brown light fine sandy loam. The soil is moderately alkaline or strongly alkaline.

Permeability is moderately slow. Available water capacity is 9.5 to 10.5 inches. Effective rooting depth is 60 inches or more.

Tome soils are used for range, watershed, wildlife habitat, and community development.

Representative profile of Tome very fine sandy loam, about 0.35 mile west of windmill, in SW¼NW¼SE¼ sec. 25, T. 9 N., R. 3 E.

A11—0 to 3 inches, brown (10YR 5/3) very fine sandy loam, dark brown (10YR 4/3) moist; weak, thin, platy structure; soft, friable; many fine and very fine roots; many fine interstitial pores; slightly calcareous; strongly alkaline; abrupt, smooth boundary.

A12—3 to 6 inches, brown (10YR 5/3) silt loam, dark brown (10YR 4/3) moist; weak, medium, subangular blocky structure; soft, friable, slightly plastic; many fine and very fine roots; common fine tubular pores; slightly calcareous; strongly alkaline; abrupt, smooth boundary.

C1—6 to 11 inches, pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak, medium, subangular blocky structure; slightly hard, friable, sticky and slightly plastic; many fine and very fine roots; many fine tubular pores; strongly calcareous; strongly alkaline; clear, wavy boundary.

C2—11 to 27 inches, light yellowish brown (10YR 6/4) heavy clay loam, brown (10YR 5/3) moist; weak, medium, subangular blocky structure; hard, firm, sticky and plastic; many fine and very fine roots and tubular pores; strongly calcareous; medium, rounded, soft lime masses; moderately alkaline; clear, wavy boundary.

C3—27 to 37 inches, pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; weak, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine tubular pores; strongly calcareous; few medium, rounded, soft lime masses; moderately alkaline; abrupt, smooth boundary.

IIC4—37 to 60 inches, brown (7.5YR 5/4) light fine sandy loam, dark brown (7.5YR 4/4) moist; massive; soft, very friable; common very fine interstitial pores; slightly calcareous; moderately alkaline.

The A horizon has value of 5 or 6 dry and 3 or 4 moist and chroma of 3 or 4 dry and moist. It ranges from very fine sandy loam to silt loam. The C horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 3 to 6. It is loam, silt loam, sandy clay loam, silty clay loam, or very fine sandy loam that is 18 to 32 percent clay and less than 15 percent material coarser than very fine sand. The lime in the C horizon ranges from disseminated to few threads. Fine sandy loam and sandy loam are below a depth of 36 inches in some profiles.

To—Tome very fine sandy loam. This is a level or nearly level soil; slopes are 0 to 2 percent. Along the edges of the mapped areas the surface layer is sandy loam. Included with this soil in mapping is an area west of the Rio Puerco where a high lime layer is at a depth of about 30 inches and the surface layer is silty clay loam. This included area makes up about 6 percent of the unit. Also included are Madurez and Wink soils, which make up 15 percent of the unit.

Runoff is medium, and the hazard of water erosion is moderate.

This soil is used for range, watershed, and wildlife habitat. Dryland capability subclass VIIe; native plant community 4.

Torrifluvents, Frequently Flooded

TP—Torrifluvents are stratified alluvial soils adjacent to the channel of the Rio Grande. They are deep, well drained to poorly drained soils. Slopes are 0 to 1 percent. The native vegetation is saltcedar and coyote willow. Elevations range from 4,850 to 4,975 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 165 to 185 days. Torrifluvents are associated with Vinton and Brazito soils.

These soils have variable characteristics. They are stratified sand or loamy sand that has pockets of gravel. There are thin strata of loam, clay loam, and silty clay loam. The soils are subject to shifting by frequent stream overflow and by soil blowing when not under water. They are strongly saline and moderately alkali affected. A seasonal water table is at or within 40 inches of the surface.

Permeability is rapid or very rapid. Available water capacity and effective rooting depth are extremely variable.

Torrifluvents are used as a source of irrigation water. They are also used for watershed, and for such recreation

as hunting small game and birds, especially waterfowl, and in places fishing. Dryland capability subclass VIIIw.

Travessilla Series

The Travessilla series consists of shallow and very shallow, well drained soils that formed in material weathered from sandstone on uplands. Slopes are 1 to 15 percent. The native vegetation is principally blue grama, side-oats grama, winterfat, small soapweed, and oneseed juniper. Elevations range from 5,500 to 7,000 feet. The mean annual precipitation is 10 to 14 inches, the mean annual air temperature is 52° to 54° F, and the frost-free season is 145 to 155 days. Travessilla soils are associated with Penistaja and Bond soils and Rock outcrop.

In a representative profile, the surface layer is light yellowish brown fine sandy loam about 4 inches thick. The underlying layer is pale brown sandy loam about 6 inches thick. Sandstone bedrock is at a depth of about 10 inches. The soil is moderately calcareous and moderately alkaline.

Permeability is moderately rapid. Available water capacity is about 1 inch to 1.5 inches. Effective rooting depth is 6 to 18 inches.

Travessilla soils are used for range, wildlife habitat, and watershed.

Representative profile of Travessilla fine sandy loam, 1 to 15 percent slopes, unsectionized, but extended NE¼SW¼SW¼ sec. 9, T. 9 N., R. 2 W.

A1—0 to 4 inches, light yellowish brown (10YR 6/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak, fine, granular structure; soft, very friable; many fine and very fine roots; many fine interstitial pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

C—4 to 10 inches, pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak, medium, subangular blocky structure grading to massive; soft, very friable, slightly sticky and slightly plastic; many fine and medium roots; many fine interstitial pores; moderately calcareous; moderately alkaline; abrupt, wavy boundary.

R—10 inches, sandstone bedrock.

Depth to bedrock ranges from 6 to 18 inches. The A horizon ranges from loamy fine sand to sandy loam. The A and C horizons have value of 4 to 7 dry and chroma of 3 to 4 dry and moist.

TQC—Travessilla fine sandy loam, 1 to 15 percent slopes. This nearly level to strongly sloping soil is on uplands west of the Rio Puerco. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Penistaja and Otero soils and sandstone rock outcrop.

Runoff is medium to rapid, and the hazard of water erosion is moderate to severe.

This soil is used for range, watershed, and wildlife habitat. Dryland capability subclass VIIs; native plant community 9.

TR—Travessilla-Rock outcrop association. This mapping unit is about 60 percent Travessilla fine sandy loam and 25 percent Rock outcrop. Slopes are 5 to 15 percent.

The Travessilla soil is on ridge crests and on ledges where runoff is medium to rapid and the hazard of water erosion is moderate to severe. Rock outcrop is mainly hard sandstone bedrock. Runoff is rapid, and the hazard of water erosion is slight.

Included in this unit in mapping are areas of Penistaja and Otero soils, which make up about 15 percent of the unit. Also included are a few narrow gravelly and sandy arroyo bottoms.

This mapping unit is used for watershed, wildlife habitat, and range. Dryland capability subclass VIIs for Travessilla soil and VIIIs for Rock outcrop; native plant community 9 for Travessilla soil.

Ustolls

Ustolls are shallow to deep, mainly very stony, well drained soils. They formed in residuum weathered from schist on sides of canyons and mountains. Slopes are 15 to 70 percent. The native vegetation is variable, but is mainly pinyon pine, oneseed juniper, black grama, and side-oats grama. Elevations range from 6,000 to 8,000 feet. The mean annual precipitation is 14 to 18 inches, the mean annual air temperature is 50° to 54° F, and the frost-free season is 110 to 150 days. Ustolls are associated mainly with Rock outcrop.

The soil characteristics of Ustolls are variable. The surface layer is brown, dark brown, or dark grayish brown stony loam, cobbly loam, or very stony loam. The subsoil is stony sandy clay loam to very stony clay. Depth to bedrock ranges from 10 to more than 60 inches. The soils are mainly slightly calcareous and mildly alkaline or moderately alkaline.

Permeability is moderate to slow. Available water capacity is about 1 inch to 6 inches. Effective rooting depth is 10 to 60 inches.

Ustolls are used for range, wildlife habitat, and watershed.

Vinton Series

The Vinton series consists of deep, well drained soils that formed in recent alluvium on flood plains of the Rio Grande. Slopes are 0 to 3 percent. The native vegetation is principally alkali sacation, sand dropseed, and fourwing saltbush. Elevations range from 4,850 to 5,300 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 165 to 185 days. Vinton soils are associated with Brazito, Bluepoint, Agua, and Gila soils.

In a representative profile, the surface layer is brown sandy loam about 10 inches thick. The underlying layers to a depth of 60 inches or more are pale brown and pinkish gray loamy sand and pinkish gray very fine sand. The soil is moderately alkaline throughout.

Permeability is moderately rapid. Available water capacity is 4 to 5 inches. Effective rooting depth is 60 inches or more.

Vinton soils are used for irrigated alfalfa, row crops, and pasture and for wildlife habitat and community development.

Representative profile of Vinton sandy loam, 0 to 1 percent slopes, one-fourth mile west of U.S. Highway 85 and 100 feet north of power line and farm road and south of the Club Canal, in south-central part of SE¼NW¼NW¼ sec. 10, T. 9 N., R. 2 E.

Ap—0 to 10 inches, brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots and interstitial pores; slightly calcareous; moderately alkaline; abrupt, smooth boundary.

C1—10 to 19 inches, pale brown (10YR 6/3) loamy sand and thin strata of sandy loam, brown (10YR 5/3) moist; massive; hard, firm; many fine and very fine roots and interstitial pores; slightly calcareous; moderately alkaline; abrupt, smooth boundary.

C2—19 to 25 inches, pinkish gray (7.5YR 6/2) loamy sand, dark brown (7.5YR 4/2) moist; massive; slightly hard, friable; many fine and very fine roots and interstitial pores; slightly calcareous; moderately alkaline; abrupt, smooth boundary.

C3—25 to 39 inches, pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; massive; soft, friable; many fine and very fine roots and interstitial pores; slightly calcareous; moderately alkaline; abrupt, smooth boundary.

C4—39 to 60 inches, pinkish gray (7.5YR 6/2) very fine sand, dark brown (7.5YR 4/2) moist; massive; hard, friable; many fine and very fine roots and interstitial pores; slightly calcareous; moderately alkaline.

The A horizon has hue of 7.5YR to 10YR, value of 5 or 6 dry and 4 to 6 moist, and chroma of 2 to 4 dry and moist. It is sandy loam, loamy fine sand, or clay loam. The C horizon has hue of 7.5YR and 10YR, value of 5 to 7 dry and 4 to 6 moist, and chroma of 2 or 3 dry and moist. Texture between depths of 10 and 40 inches averages loamy sand, but thin strata of loamy fine sand and sandy loam occur in this section.

Va—Vinton loamy sand. This level soil is in the irrigated Rio Grande Valley. It has a profile similar to that described as representative of the series, but the surface layer differs in texture and is pale brown. In most areas the water table is below 60 inches, but on about 1.5 percent of the acreage it fluctuates between 45 and 60 inches. Slopes are 0 to 1 percent.

Included with this soil in mapping are a few areas of a soil that is loamy in the substratum below a depth of 35 inches. Also included are small areas of Brazito, Gila, and Bluepoint soils.

Runoff is very slow, and the hazard of soil blowing is moderate or severe.

This soil is used for irrigated alfalfa, row crops, and pasture. It is also used for wildlife habitat and community development. Irrigated capability unit IIIe-11.

VbA—Vinton sandy loam, 0 to 1 percent slopes. This level soil is in the irrigated Rio Grande Valley. It has the profile described as representative of the series. In most areas the seasonal water table is below 60 inches, but on about 2 percent of the acreage it is between depths of 45 and 60 inches and the soil is moderately saline.

Included with this soil in mapping are small areas of Brazito and Gila soils and Vinton soils that have a surface layer of sandy clay loam, loam, or loamy fine sand.

Runoff is slow, and the hazard of soil blowing is severe.

This soil is used for irrigated alfalfa, row crops, and pasture. It is also used for wildlife habitat and community development. Irrigated capability unit IIIe-11.

VBB—Vinton sandy loam, 1 to 3 percent slopes. This nearly level soil is in the valley west of the Rio Puerco. Included in mapping are small areas of Gila and Hantz soils.

Runoff is slow. The hazard of water erosion is moderate, and the hazard of soil blowing is severe.

This soil is used for range, watershed, and wildlife habitat. Dryland capability subclass VIIe; native plant community 2.

Vc—Vinton clay loam. This level soil is in the irrigated Rio Grande Valley. It has a profile similar to that described as representative of the series, but the surface layer differs in texture, is reddish gray, and is about 12 inches thick. Slopes are 0 to 1 percent.

Included with this soil in mapping are small areas of Brazito, Gila, and Agua soils.

Runoff is slow, and the hazard of water erosion is slight.

This soil is used for irrigated alfalfa, row crops, and pasture. It is also used for wildlife habitat and community development. Irrigated capability unit IIs–4.

VF—Vinton and Brazito soils, occasionally flooded. This mapping unit is 35 percent Vinton soil and 30 percent Brazito soil. It is in the area unprotected by levees next to the Rio Grande. The soils are somewhat stabilized by cottonwoods, saltcedar, and willows. Although subject to change through periodic flooding, they have remained in place long enough for plants to become stabilized.

The Vinton soil has a profile similar to that described as representative of the Vinton series, but the surface layer ranges from sand to clay and is dominantly sand, loamy sand, or sandy loam. Runoff and the hazard of water erosion are slight, except during periods of flooding.

The Brazito soil is similar to that described as representative of the Brazito series, but the surface layer ranges from sand to clay and is dominantly sand, loamy sand, and sandy loam. Runoff and the hazard of water erosion are slight, except during periods of flooding.

The soils in this mapping unit are moderately alkali to strongly alkali affected and slightly saline to moderately saline. In most areas they have a seasonal water table above a depth of 60 inches.

Included in this unit in mapping are areas of the Agua variant, which make up 15 percent of the unit. Also included are areas of Gila, Anapra, and Agua soils and the frequently flooded Torrifluvents, which make up 20 percent of the unit.

This mapping unit is used for wildlife habitat and recreation. It has a potential use for wood products. Dryland capability subclass VIIw; native plant community 13.

Wink Series

The Wink series consists of deep, well drained soils that formed in old unconsolidated alluvium modified by wind on piedmonts. Slopes are 0 to 7 percent. The native vegetation is principally blue grama, broom snakeweed, and sand dropseed. Elevations range from about 5,000 to 6,000 feet. The mean annual precipitation is 7 to 10 inches, the mean annual air temperature is 58° to 60° F, and the frost-free season is 170 to 195 days. Wink soils are associated with Madurez, Latene, Bluepoint, and Embudo soils.

In a representative profile, the surface layer is brown fine sandy loam and sandy loam about 11 inches thick. The subsoil is light brown sandy loam about 16 inches thick. The substratum to a depth of 60 inches or more is pinkish gray and pinkish white sandy loam. The soil is calcareous and moderately alkaline.

Permeability is moderately rapid. Available water capacity is 5.5 to 8 inches. Effective rooting depth is 60 inches or more.

Wink soils are used for range, watershed, wildlife habitat, and community development.

Representative profile of Wink fine sandy loam, 0 to 5 percent slopes, 0.8 of a mile north of power lines and 150 feet east of road, in SW¼ sec. 23, T. 10 N., R. 1 E.

A11—0 to 6 inches, brown (7.5YR 5/3) fine sandy loam, dark brown (7.5YR 4/3) moist; weak, medium, subangular blocky structure; soft, very friable, slightly sticky; common fine roots; many fine interstitial pores; slightly calcareous; moderately alkaline; clear, smooth boundary.

A12—6 to 11 inches, brown (7.5YR 5/3) sandy loam, dark brown (7.5YR 4/3) moist; weak, medium, subangular blocky structure; soft, very friable, slightly sticky; common fine roots; many fine interstitial pores; slightly calcareous; moderately alkaline; clear, smooth boundary.

B2—11 to 19 inches, light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/3) moist; weak, medium, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots and tubular pores; strongly calcareous; moderately alkaline, clear, smooth boundary.

B3ca—19 to 27 inches, light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4) moist; moderate, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine roots and tubular pores; many fine, hard and soft lime masses; strongly calcareous; moderately alkaline, clear, smooth boundary.

C1ca—27 to 35 inches, pinkish gray (7.5YR 7/2) sandy loam, brown (7.5YR 5/2) moist; weak, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine roots; many fine tubular and interstitial pores; many fine, hard and soft, white masses of lime: strongly calcareous; moderately alkaline; abrupt, smooth boundary.

C2ca—35 to 60 inches, pinkish white (7.5YR 8/2) sandy loam, pinkish gray (7.5YR 7/2) moist; massive; very hard, firm, slightly sticky; few fine tubular pores; weakly cemented; strongly calcareous; moderately alkaline.

The A horizon has value of 4 to 6 dry and 4 or 5 moist and chroma of 3 or 4. It is sandy loam, fine sandy loam, or loamy fine sand. The B horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and moist, and chroma of 3 or 4. It is loam or sandy loam. The Cca horizon has hue of 7.5YR or 10YR, value of 6 to 8 dry and 4 to 7 moist, and chroma of 2 to 4. It is clay loam below a depth of 40 inches in places.

WaB—Wink fine sandy loam, 0 to 5 percent slopes. This level to gently sloping soil is on the East and West Mesas. It has the profile described as representative of the series.

Included with this soil in mapping are areas of a Wink soil that has a thin surface layer of loamy sand. This included soil makes up about 10 percent of the unit. Also included are Latene soils, which make up 5 percent.

Runoff is medium. The hazard of water erosion is slight to moderate and the hazard of soil blowing is moderate.

This soil is used for range, watershed, wildlife habitat, and community development. Dryland capability subclass VIIe; native plant community 4.

WeB—Wink-Embudo complex, 0 to 5 percent slopes. This mapping unit is about 65 percent a Wink fine sandy loam that has 1 to 5 percent slopes and 25 percent Embudo gravelly fine sandy loam, 0 to 5 percent slopes.

The Wink soil is on slight rises and ridges. It has a profile similar to that described as representative of the series, but it is alkaline and has a pale brown fine sandy loam surface layer about 4 inches thick and a strongly alkaline clay loam substratum below a depth of 40 inches. On about 70 percent of the acreage of Wink soil, the content of exchangeable sodium is more than 15 percent. The Embudo soil is in shallow depressions. It has a profile similar to that described as representative of the Embudo series, but the surface layer is yellowish brown gravelly fine sandy loam about 8 inches thick. On both soils, runoff is medium and the hazard of water erosion is moderate.

Included in this unit in mapping are areas of Madurez, Tijeras, and Kokan soils, which make up about 10 percent of the unit.

This mapping unit is used for community development, watershed, and wildlife habitat. Flooding and poor compaction are potential problems where this mapping unit is used for community development. Dryland capability subclass VIIe; native plant community 4.

WM—Wink-Madurez association. This mapping unit is about 65 percent a Wink fine sandy loam that has 1 to 7 percent slopes and 20 percent a Madurez fine sandy loam that has 1 to 5 percent slopes.

The nearly level to moderately sloping Wink soil is in slightly convex areas where runoff is medium and the hazard of soil blowing is severe. It has a profile similar to that described as representative of the Wink series, but the surface layer is winnowed and about 6 inches thick. The nearly level or gently sloping Madurez soil is mainly in slightly concave areas where runoff is medium and the hazard of soil blowing is moderate. It has a profile similar to that described as representative of the Madurez series, but the surface layer is winnowed and about 5 inches thick.

Included in this unit in mapping are areas of Bluepoint, Pajarito, and Latene soils, which make up about 15 percent of the unit.

This mapping unit is used for range, watershed, and wildlife habitat. Dryland capability subclass VIIe; native plant community 4.

Witt Series

The Witt series consists of deep, well drained soils that formed in sediment derived from mixed rocks on uplands. Slopes are 2 to 9 percent. The native vegetation is principally blue grama, ring muhly, western wheatgrass, pinyon pine, and oneseed juniper. Elevations range from 6,500 to 7,500 feet. The mean annual precipitation is 10 to 14 inches, the mean annual air temperature is about 52° to 55° F, and the frost-free season is 120 to 155 days. Witt soils are associated with Silver, Manzano, and Laporte soils.

In a representative profile, the surface layer is dark yellowish brown very fine sandy loam about 4 inches thick. The subsoil is reddish brown silty clay loam about 24 inches thick. The substratum to a depth of 60 inches or more is pinkish white light silty clay loam. The soil is mildly alkaline or moderately alkaline.

Permeability is moderately slow. Available water capacity is 11 to 12 inches. Effective rooting depth is 60 inches or more.

Witt soils are used for range, wildlife habitat, watershed, and community development.

In this survey area, Witt soils are mapped only with Silver soils.

Representative profile of Witt very fine sandy loam, from an area of Silver and Witt soils, 2 to 5 percent slopes, in SE¼SE¼ sec. 21, T. 8 N., R. 7 E.

A1—0 to 4 inches, dark yellowish brown (10YR 4/4) very fine sandy loam, dark yellowish brown (10YR 3/4) moist; weak, thin, platy structure; soft, friable; many fine roots; many fine interstitial pores; mildly alkaline; clear, smooth boundary.

B2t—4 to 17 inches, reddish brown (5YR 4/4) silty clay loam, dark reddish brown (5YR 3/4) moist; moderate, medium, blocky structure; hard, firm, sticky and plastic; many fine roots and tubular pores; common thin clay films on peds; mildly alkaline; clear, smooth boundary.

B3tca—17 to 28 inches, reddish brown (5YR 4/4) silty clay loam, dark reddish brown (5YR 3/4) moist; moderate, medium, blocky structure; hard, firm, sticky and plastic; many fine tubular pores; common thin clay films on peds; slightly calcareous; moderately alkaline; clear, smooth boundary.

Cca—28 to 60 inches, pinkish white (7.5YR 8/2) light silty clay loam, pink (7.5YR 7/4) moist; massive; hard, firm, slightly sticky and slightly plastic; many fine roots and tubular pores; strongly calcareous with many soft masses of lime; moderately alkaline.

The A horizon has hue of 7.5YR to 10YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 3 or 4. It is loam, very fine sandy loam, or light clay loam. The B horizon has hue of 5YR or 7.5YR, value of 4 to 6 dry and 3 or 4 moist, and chroma of 3 to 6. It is heavy loam, clay loam, or silty clay loam. The Cca horizon has hue of 5YR to 7.5YR, value of 6 to 8 dry and moist, and chroma of 2 to 4. The calcium carbonate equivalent ranges from 15 to 35 percent.

Use and Management of Soils

This section explains the general management of irrigated crops and pasture in the survey area. It explains the capability grouping of soils by units and shows the estimated crop yields of irrigated soils. It also describes the native plant communities and wildlife habitat in the area and interprets data on soils used in engineering projects and in recreational developments.

Irrigated Crops and Pasture

Important management for the irrigated soils in the survey area is described in the paragraphs that follow.

Cover crop.—A soil-improving crop of close-growing grasses, legumes, or small grain planted primarily for winter or summer protection and soil improvement. It is usually grown for no more than 1 year, except in areas, such as orchards, where cover is permanent.

Cropping system.—A good cropping system is one in which suitable crops are rotated with other crops to maintain or increase the organic-matter content, to improve the fertility and structure of the soil, to reduce the risk of erosion, to treat special hazards or soil conditions, and to help in controlling weeds, insects, and diseases. All crops should be grown in a sequence that will achieve the purpose of the system.

Crop residue.—Sufficient crop residue should be maintained on or near the soil surface to furnish protection from erosion, to improve soil tilth, to conserve moisture, and to increase water infiltration. It is generally beneficial to add nitrogen fertilizer to compensate for the nitrogen that becomes unavailable when large amounts of organic matter are returned to the soil.

Fertilization.—These soils generally are low in organic-matter content and available nitrogen. Phosphorus is needed for alfalfa and most truck and fruit crops. Iron deficiencies may occur in horticultural, fruit, nut, and specialty crops. Additional potassium is generally not needed for low or medium crop production. The amount of fertilizer needed depends on the crop to be grown, on past cropping history, on the level of yield desired, and on the kind of soil. It should be based on results of soil or plant tissue tests.

Grasses and legumes in rotation.—Soil-improving crops of perennial grasses, legumes, or a mixture of both, are grown, managed, and maintained for a definite number of years.

High residue crops.—This crop produces at least 3,000 pounds per acre of air-dry, or green weight equivalent, residue, which is maintained on or near the soil surface.

Irrigation ditch lining.—Irrigation field ditches, canals, or laterals can be lined with impervious material, such as concrete, asphalt, or other durable material. Ditch or canal lining reduces water loss, prevents waterlogging of soils, prevents erosion, and provides easier irrigation. The greatest water loss in irrigation field ditches without lining is on Bluepoint, Brazito, and Vinton soils.

Irrigation land leveling.—Land leveling is reshaping to planned grades the surface of land to be irrigated. It aids the uniform and efficient application of irrigation water without excessive erosion and provides adequate surface drainage. Deep cuts should be avoided on Brazito soils. Bluepoint soils require the greatest reshaping before they can be irrigated.

Irrigation systems.—Surface, subsurface, and sprinkler irrigation systems are installed to efficiently convey and distribute irrigation water without excessive erosion or water losses.

Irrigation water management.—Water management is the efficient use of irrigation water to achieve optimum crop yields and to minimize losses of soil and plant nutrients. The irrigation schedule must be adjusted to meet soil moisture conditions and crop needs. The stream size must be controlled and adjusted for control of erosion. Brazito and Bluepoint soils require a larger stream size because both infiltration and permeability are rapid.

Permanent pasture and hayland.—Irrigated soils can be managed as pasture or hayland.

Soil-depleting crop.—Any crop can be managed in such a way that it lowers the level of organic matter, increases the loss of soil and water, and reduces productivity.

Capability Grouping

The capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations if used for field crops, the risk of damage if they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of

the soils; does not consider possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability grouping can infer from it much about the behavior of soils when used for other purposes. This grouping, however, is not a substitute for interpretations designed to show suitability and limitations for range, for forest trees, or for engineering.

In the capability system, the kinds of soil are grouped at three levels: the capability class, the subclass, and the unit. These levels are described in the following paragraphs.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture or range, woodland, or wildlife. (No soils in this survey are in Class V.)

Class VI soils have severe limitations that make them generally unsuitable for cultivation and limit their use largely to pasture or range, woodland, or wildlife.

Class VII soils have very severe limitations that make them unsuitable for cultivation and that restrict their use largely to pasture or range, woodland, or wildlife.

Class VIII soils and landforms have limitations that preclude their use for commercial crop production and restrict their use to recreation, wildlife, or water supply or to esthetic purposes.

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding the small letter *e*, *w*, *s*, or *c* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used only in some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In Class I, there are no subclasses because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c* because the soils in Class V are subject to little or no erosion. Other limitations, however, restrict their use largely to pasture or range, woodland, wildlife, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIs–4 or IVe–11. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

Management of irrigated soils by capability units [3]

This section describes the capability subclasses and capability units for irrigated soils in the survey area. It discusses characteristics of the soils in each unit, present and potential uses, and suitable management practices.

The soil series represented are named in the description of the capability unit, but not all the soils of a given series necessarily appear in the unit. To find the names of all the soils in any given capability unit, refer to the "Guide to Mapping Units" at the back of this survey.

The capability units in this survey area are numbered according to a system used in a land resource area larger than this survey area. Consequently the numbering of the capability units is not always consecutive.

IRRIGATED CAPABILITY UNIT I

This unit consists of well drained loams and clay loams over fine sandy loam, silt loam, and clay loam. Slopes are 0 to 1 percent. The mean annual precipitation is 7 to 10 inches, and the frost-free season is 165 to 185 days. Permeability is moderate or moderately slow. Runoff is very slow or slow, and the hazard of erosion is slight. Available water capacity is 8 to 12.5 inches, and the effective rooting depth is 60 inches or more. Levees protect the soils on flood plains from flooding.

These soils are used for irrigated alfalfa, small grain, row crops, and permanent pasture. They are also used for wildlife habitat and community development. They are well suited to all crops grown in the area and to surface or subsurface irrigation.

A soil-improving crop is needed in the cropping system to maintain good tilth. Returning crop residue to the soil helps to maintain the organic-matter content, the soil structure, and the water-intake rate. Nitrogen is needed for most crops, and phosphorus is needed for alfalfa and other legumes. If the surface layer is clay loam, it is easily compacted when wet and tillage must be timed to prevent clodding. Both mechanical and chemical methods are used to control annual and perennial weeds.

An efficient and well managed irrigation system is needed for optimum production. Leveling and smoothing of the soils are required if surface irrigation is used. Controlled irrigation is necessary to prevent the scalding

[3] J. V. McDonald, Jr., conservation agronomist, helped prepare this section.

or the drowning out of crops. It is especially needed if the surface layer is clay loam.

IRRIGATED CAPABILITY UNIT IIs-4

This unit consists of deep, well drained loams, silt loams, clay loams, or silty clay loams over very fine sandy loam, loam, clay loam, and loamy sand. Sand is at a depth of 20 to 36 inches. Slopes are 0 to 1 percent. The mean annual precipitation is 7 to 10 inches, and the frost-free season is 165 to 185 days. Permeability is moderately rapid, moderate, or moderately slow. Runoff is very slow or slow, and the hazard of water erosion is slight. Available water capacity is 4 to 7.5 inches. The effective rooting depth is 20 to 60 inches, but some alfalfa roots can penetrate into the sand substratum.

These soils are used for irrigated crops, pasture, and hay. They are also used for wildlife habitat and community development. They are suited to most plants grown in the area. Alfalfa and perennial grasses are the major crops. Surface irrigation is better suited than other methods. Deep cuts in land leveling should be avoided in areas where the underlying sand is close to the surface.

Maintaining soil fertility, using irrigation water efficiently, and controlling annual and perennial weeds are management needs. A high-residue crop or a soil-improving crop should be grown in rotation with other crops on an average of once every 3 years. Also suitable is 3 years of grasses and legumes in rotation with other crops. Because the clay loams and silty clay loams compact when moist, crack when dry, and seal over when wet, timely tillage is needed to prevent clods and controlled irrigation is needed to avoid the scalding or the drowning out of crops. Commercial fertilizer or manure is needed to maintain productivity and soil fertility. Tillage should be limited. Wet soil should not be tilled.

IRRIGATED CAPABILITY UNIT IIs-5

This unit consists of deep, well drained, slightly saline loams or clay loams over stratified sandy loam, very fine sandy loam, loam, silt loam, and clay loam. Slopes are 0 to 1 percent. The mean annual precipitation is 7 to 10 inches, and the frost-free season is 165 to 185 days. Permeability is moderate or moderately slow. Runoff is slow, and the hazard of water erosion is slight. Unless protected, the soils are subject to blowing. Available water capacity is 4 to 7 inches, and the effective rooting depth is 60 inches or more. A seasonal water table is at a depth of 45 to 60 inches.

These soils are used for irrigated crops, pasture, and hay. They are also used for wildlife habitat and community development. They are suited to most plants grown in the area, but are best suited to salt-tolerant plants. Alfalfa and perennial grasses are the major crops. Surface or subsurface irrigation is suitable.

Draining these soils to lower the water table and leaching them of toxic salts are beneficial. Maintaining soil fertility, using irrigation water efficiently, and controlling annual and perennial weeds are additional management needs. A high-residue crop or a soil-improving crop should be grown in rotation with other crops on an average of once every 3 years. Also suitable is 3 years of grasses and legumes in rotation with other crops. Commerical fertilizer or manure is needed to maintain productivity and soil fertility. Tillage should be limited. Wet soil should not be tilled.

IRRIGATED CAPABILITY UNIT IIIe-11

This unit consists of deep, well drained and somewhat excessively drained sandy loams, loamy sands, or loamy fine sands over loamy fine sand to loamy sand. Slopes are 0 to 3 percent. The mean annual precipitation is 7 to 10 inches, and the frost-free season is 165 to 195 days. Permeability is moderately rapid or rapid. Runoff is slow or very slow. The hazard of water erosion is slight, and the hazard of soil blowing is severe. The soils are droughty. Available water capacity is 4.0 to 5.5 inches, and the effective rooting depth is 60 inches or more.

These soils are used for irrigated crops, pasture, and hay. They are also used for wildlife habitat and community development. They are suited to most plants grown in the area, but chlorosis can be a problem with some plants and crops. Alfalfa and perennial grasses are the major crops. Sprinkler or surface irrigation is suitable. In places bench leveling is required on slopes greater than 1 percent. Field investigation is needed before making deep cuts in land leveling because of the fine sand substratum.

Maintaining soil fertility, using irrigation water efficiently, and controlling annual and perennial weeds are management needs. A high-residue crop or a soil-improving crop should be grown in rotation with other crops on an average of once every 2 years. Also suitable is 3 years of grasses and legumes in rotation with other crops. Commercial fertilizer or manure is needed to maintain productivity and soil fertility. Some plants and crops benefit from applications of potassium or trace elements, or both. Tillage should be limited.

IRRIGATED CAPABILITY UNIT IIIs-1

The one soil in this unit, Armijo clay loam, is a deep, well drained clay loam over clay. Slopes are 0 to 1 percent. The mean annual precipitation is 7 to 10 inches, and the frost-free season is 165 to 185 days. Permeability is very slow. Runoff is very slow, and the hazard of water erosion is slight. Available water capacity is 6.5 to 8 inches, and the effective rooting depth is 60 inches or more.

This soil is used for irrigated crops, pasture, and hay. It is also used for wildlife habitat and community development. It is suited to most plants grown in the area, but is best suited to vegetables grown above ground. Alfalfa and perennial grasses are the major crops. Surface irrigation is better suited than other methods.

This soil is difficult to keep in good tilth. It cracks when dry and swells when wet and is easily compacted when wet. Unless protected, it is subject to blowing.

Maintaining soil fertility, using irrigation water efficiently, and controlling annual and perennial weeds are management needs. A high-residue crop or a soil-improving crop should be grown in rotation with other crops on an average of once every 2 years. Also suitable is 3 years of grasses and legumes in rotation with other crops. Because this soil cracks when dry and seals over when wet, timely tillage is needed to prevent clods and controlled irrigation is needed to prevent the scalding or the drowning out of crops. Commercial fertilizer or manure is needed to

maintain productivity and soil fertility. Potassium or trace elements, or both, are beneficial to some plants and crops. Tillage should be limited. Wet soil should not be tilled.

IRRIGATED CAPABILITY UNIT IIIs-8

This unit consists of deep, well drained fine sandy loams or silty clay loams over coarse sand. Slopes are 0 to 1 per cent. The mean annual precipitation is 7 to 10 inches, and the frost-free season is 165 to 185 days. Permeability is rapid to a depth of more than 3 feet. Runoff is very slow or slow, and the hazard of water erosion is slight. The soils are droughty and unless protected, are subject to soil blowing. Available water capacity is 4 to 5.5 inches, and the effective rooting depth is 11 to 20 inches.

These soils are used for irrigated crops, pasture, and hay. They are also used for wildlife habitat and community development. They are suited to most plants grown in the area and to surface irrigation. Alfalfa and perennial grasses are the major crops. Deep cuts in land leveling should be avoided because of the underlying coarse sand below a depth of about 12 inches.

Maintaining soil fertility, using irrigation water efficiently, and controlling annual and perennial weeds are management needs. A high-residue crop or a soil-improving crop should be grown in rotation with other crops on an average of once every 2 years. Also suitable is 3 years of grasses and legumes in rotation with other crops. Commercial fertilizer or manure is needed to maintain productivity and soil fertility. Tillage should be limited. Wet soil should not be tilled.

IRRIGATED CAPABILITY UNIT IIIs-10

The one soil in this unit, Gila loam, moderately alkali, is a deep, well drained loam over very fine sandy loam and sandy loam that extend to a depth of 3 feet or more. Slopes are 0 to 1 percent. The mean annual precipitation is 7 to 10 inches, and the frost-free season is 165 to 185 days. Permeability is moderate. Runoff is slow, and the hazard of erosion is slight. Available water capacity is 4 to 7 inches, and the effective rooting depth is 60 inches or more.

Unless protected, this soil is subject to blowing. It is easily dispersed, and a crust forms readily.

This soil is used for irrigated crops, pasture, and hay and for wildlife habitat. Alfalfa and perennial grasses are the major crops. The choice of plants is somewhat limited because of alkali. On about 30 percent of the acreage, only alkali-tolerant crops are suited. Surface irrigation is the most suitable.

Maintaining soil fertility, using irrigation water efficiently, and controlling annual and perennial weeds are management needs. A high-residue crop or a soil-improving crop should be grown in rotation with other crops on an average of once every 2 years. Also suitable is 3 years of grasses and legumes in rotation with other crops. Commercial fertilizer or manure is needed to maintain productivity and soil fertility. Some plants and crops benefit from the application of potassium or trace elements, or both. Tillage should be limited. Wet soil should not be tilled. These alkali soils can be improved by using gypsum or other chemical amendments and leaching the alkali (sodium).

IRRIGATED CAPABILITY UNIT IVe-11

This unit consists of deep, well drained silty clay loams to sands over sand. Slopes are 0 to 1 percent. The mean annual precipitation is 7 to 10 inches, and the frost-free season is 165 to 185 days. Permeability is rapid to a depth of more than 3 feet. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate to severe. Available water capacity is 3.5 to 5.5 inches, and the effective rooting depth is 3 to 10 inches.

These soils are used for irrigated pasture and for wildlife habitat and community development. The choice of plants is limited because of low fertility and droughtiness. Perennial grasses are best suited. Chlorosis is a problem on some crops. Surface or sprinkler irrigation is suitable. Deep cuts in land leveling should be avoided because of the underlying sand at a depth of about 9 inches.

Maintaining soil fertility, using irrigation water efficiently, and controlling annual and perennial weeds are management needs. A high-residue crop or a soil-improving crop should be grown in rotation with other crops on an average of twice every 3 years. Also suitable is 4 years of grasses and legumes in rotation with other crops. Commercial fertilizer or manure is needed to maintain productivity and soil fertility. Some plants and crops benefit from the application of potassium or trace elements, or both. Tillage should be limited.

IRRIGATED CAPABILITY UNIT IVw-1

The one soil in this unit, Agua loam, wet variant, is a deep, somewhat poorly drained loam over loamy very fine sand. Sand is at a depth of 30 inches or more. Slopes are 0 to 1 percent. The mean annual precipitation is 7 to 10 inches, and the frost-free season is 165 to 185 days. Permeability is moderate to about a depth of 24 inches and rapid below. Runoff is slow, and the hazard of erosion is slight. Available water capacity is 5 or 6 inches, and the effective rooting depth is 20 to 34 inches.

This soil has a seasonal water table between depths of 30 and 60 inches. It is moderately saline, and crusts of salt form on the surface. The soil is easily reclaimed by drainage, leaching, and good management.

This soil is used for irrigated pasture and for wildlife habitat and recreation. It is suitable for surface irrigation. The choice of plants is greatly limited because of salinity and the high water table. Grasses tolerant of salts, sodium, and the high water table are best suited.

Maintaining soil fertility, using irrigation water efficiently, and controlling annual and perennial weeds are management needs. Artificial drainage and leaching to remove excess salts are beneficial. A high-residue crop or a soil-improving crop should be grown in rotation with other crops on an average of twice every 3 years. Also suitable is 4 years of grasses and legumes in rotation with other crops. Commercial fertilizer or manure is needed to maintain productivity and soil fertility. In places special water management and the addition of soil amendments are needed. Tillage should be limited. Wet soil should not be tilled.

Estimated yields of irrigated crops

The estimated yields shown in table 2 are averages that can be expected over a period of years. They are based on

TABLE 2.—*Estimated average yields per acre of the principal crops*

[Yields are those to be expected under a moderately high level of management. Dashes indicate that the specified crop is not suited to the soil or is not commonly grown on it. Only arable soils are listed]

Soil	Alfalfa	Sweet corn	Corn or sorghum for silage	Green chile	Tame pasture
	Tons	*Bu*	*Tons*	*Cwt*[1]	*AUM*[2]
Agua loam	7.0	340	24.0	155	14
Agua silty clay loam	7.0	335	23.0	150	13
Agua loam, wet variant	4.0				8
Anapra silt loam	7.0	342			14
Anapra silty clay loam	7.0	335	22.0		13
Armijo clay loam	4.0	200			8
Bluepoint loamy fine sand, 1 to 3 percent slopes	6.0				12
Brazito fine sandy loam	6.0	255	19.5		11
Brazito silty clay loam	6.0	255	19.5		11
Brazito complex	5.0				11
Gila loam	8.0	342	28.0	180	10
Gila loam, slightly saline	6.0	255	21.0		16
Gila loam, moderately alkali	5.5	225	21.0		12
Gila clay loam	8.0	342	26.0	170	11
Glendale loam	7.5	340	26.0		16
Glendale clay loam	7.0	340	24.0		14
Vinton loamy sand	6.0				12
Vinton sandy loam, 0 to 1 percent slopes	6.0	204			13
Vinton clay loam	7.0	255	23.0		14

[1] 35 pounds per bushel green weight.

[2] Animal-unit-month, a term used to express the carrying capacity of pasture. It is the number of animal units per acre multiplied by the number of months the pasture is grazed during a single grazing season without injury to the sod. An acre of pasture that provides 7 months of grazing for two cows has a carrying capacity of 14 animal-unit-months.

results of research and on information obtained in interviews with farmers and other informed people.

The yields are for a moderately high level of management.

The following is assumed—

1. The cropping system includes crops that produce a large amount of residue and crops that improve the soil.
2. Suitable crop varieties are selected, and seed is planted at the proper time and at the correct rate.
3. The right kind of fertilizer is applied in proper amount and at the proper time.
4. The soils are tilled carefully at the right time and with the right kind of implements so that crop residue is utilized and excessive compaction is avoided.
5. Insect pests, weeds, and plant diseases are controlled.
6. Length and slope of irrigation runs are suitable, and surface, subsurface, and sprinkler irrigation systems are properly designed.
7. Irrigation water is applied in accordance with crop needs and at the proper time.
8. Crops are harvested at the proper time and with equipment that is properly operated.

Yields may change in the future as a result of the development of new crop varieties that will tolerate the diseases and insect pests common in the area. Yields higher than the estimates are not uncommon in small fields and in experimental plots.

Dryland capability classification

The soils in this survey area are grouped at two levels of dryland capability classification, the capability class and the subclass. The subclass is indicated at the end of the descriptions of soils used for range or dryland crops. The subclasses in this survey area are described as follows:

Subclass VIe soils are generally unsuitable for cultivation or are severely limited, chiefly by the risk of erosion unless protective cover is maintained.

Subclass VIs soils are generally unsuitable for cultivation and are restricted for other uses by limited water capacity, gravel, or fine texture.

Subclass VIIe soils are unsuitable for cultivation or are very severely limited, chiefly by the risk of erosion unless protective cover is maintained.

Subclass VIIw soils are unsuitable for cultivation or are very severely limited, chiefly by the risk of flooding and a high water table.

Subclass VIIs soils are unsuitable for cultivation or are very severely limited, chiefly by shallowness, stones, alkali, or other soil features.

Subclass VIIIe land areas have little potential for plants, chiefly because the hazard of erosion is excessive.

Subclass VIIIs land areas have little potential for plants, chiefly because of the risk of flooding and the hazard of erosion.

Subclass VIIIs land areas are mainly rock or other material that has little potential for plants.

Native Plant Communities [4]

A natural plant community is the product of all environmental factors, including, but not limited to, climate, soil, and topography. Soils are grouped into plant communities according to their capacity to produce similar kinds, amounts, and proportions of native plants. The information that follows can be adapted to the management of range sites.

The plant communities in this survey area never develop a high density of ground cover. At the lower elevations precipitation is low, evaporation is high, and the ground cover seldom exceeds 20 percent. The higher elevations have more precipitation, less evaporation, and a somewhat denser plant cover.

Plant communities are affected by any abnormal disturbance, such as soil blowing and water erosion, fire, traffic, and excessive animal use. Depending on the kinds of soil and plants in the community certain plants are replaced in part or entirely by other plants that adapt to the altered and more adverse growing conditions induced by the influences exerted on the plant community. The plant community can be completely destroyed by a severe disturbance. If the site is not deteriorated significantly under such disturbance, plant succession progresses in the direction of the natural potential plant community for the soil.

Changes occur in the plant community because of particular kinds of use or disturbance. How a plant reacts to a disturbance depends on the species, the kind of influence, and the duration of the disturbance.

Knowledge of the plant communities, both present and potential, and information on the soils provide a basis for selecting alternative uses. Any use of a native plant community should be compatible with conservation objectives and provide a plant cover that protects and improves the soil and water resources and also meets the desires and needs of the user.

Native plant communities of the survey area are described on the following pages. Plants are listed in order of their dominance in the plant community.

Not assigned to native plant communities are land areas having only limited vegetative growth and irrigated soils, which are managed mainly as irrigated cropland or tame pasture. The native plant community is listed for each applicable soil in the "Guide to Mapping Units."

NATIVE PLANT COMMUNITY NO. 1

This plant community is on bottom land along drainageways and flood plains of the Rio Grande and Rio Puerco. It receives runoff from the surrounding slopes. The soils are deep and commonly saline-alkali silty clay loams, silty clays, sandy loams, or loamy sands. Elevations are mainly 4,850 to 6,000 feet, but in places range to 7,500 feet. Annual precipitation ranges from 7 to 14 inches.

This plant community is a grass-shrub mixture that covers approximately 20 percent of the soil surface. Alkali sacaton, the dominant plant, is 50 percent of the total vegetation by weight. Associated grass plants are vine-mesquite, blue grama, western wheatgrass, tobosa, galleta, burrograss, inland saltgrass, and mat muhly. Fourwing saltbush is the major shrub. Less abundant are rubber rabbitbrush, winterfat, and shadscale. Mesquite has invaded this plant community in places. Common annual plants are Russian-thistle, cocklebur, and sunflowers.

If this plant community is disturbed, the kinds and amounts of annual plants become more prominent. There is an increase in the fourwing saltbush and other shrubby plants and a decrease in the amount of grasses. The more persistent grass plants are burrograss, inland saltgrass, and tobosa.

NATIVE PLANT COMMUNITY NO. 2

This plant community is mostly in gently undulating to rolling areas, some of which occur as dunes. The soils are deep and mainly are loamy fine sands or sandy loams. Elevations range from 4,850 to 6,000 feet. Annual precipitation ranges from 7 to 10 inches.

This plant community is a grass-shrub mixture that generally covers about 15 percent of the soil surface. Indian ricegrass is the dominant grass. Associated grass plants are black grama, giant dropseed, bush muhly, galleta, sand dropseed, mesa dropseed, spike dropseed, sand bluestem, little bluestem, blue grama, and three-awn. These perennial grasses are about 75 percent of the total vegetation by weight. Sand sagebrush is the dominant shrub. Less abundant are fourwing saltbush, Mormon-tea, wolfberry rubber, rabbitbrush, winterfat, broom dalea, broom snakeweed, and bush mint. Cholla cactus, pricklypear cactus, and small soapweed are in a few places. These shrub plants are 15 percent of the total vegetation by weight. Annual plants are jimsonweed, fiddleneck, daisy, verbena, tansymustard, aster, lambsquarters, and six-weeks grama. These annual plants are about 10 percent of the total vegetation by weight.

If this plant community is disturbed, the hazard of soil blowing is severe, blowout areas become more dominant, and shrubby plants increase.

NATIVE PLANT COMMUNITY NO. 3

This plant community has deep soils that are gravelly fine sandy loams to very gravelly sands. Elevations range 4,850 to 6,000 feet. Annual precipitation ranges from 7 to 10 inches.

This plant community is a grass-shrub mixture that covers approximately 10 percent of the soil surface. Black grama and bush muhly, the dominant grasses, are 25 to 50 percent of the total vegetation by weight. Associated grasses are Indian ricegrass, bottlebrush squirreltail, needleandthread, New Mexico feathergrass, sand dropseed, mesa dropseed, three-awn, and galleta. Grasses are about 75 percent of the total vegetation by weight. Fourwing saltbush is the major shrub. Less abundant are sand sagebrush, creosotebush, winterfat, broom snakeweed, brickellbush, and rubber rabbitbrush and, generally, sotol and cholla cactus. Shrubs are about 15 percent of the total vegetation by weight. Globemallow, groundsel, buffalobur, and herbaceous sage are the major perennial forbs. Common annual plants are fiddleneck, lambsquarters, Indian paintbrush, and loco, which are about 10 percent of the vegetation by weight.

This plant community is stable because of the gravelly soils. If it is disturbed, however, the annual plants in-

[4] HENRY E. WALL, area range conservationist, and RICHARD FARMER, district conservationist, Soil Conservation Service, helped prepare this section.

crease and become more prominent and the shrub plants increase in size and amount. Also, pricklypear cactus and cholla cactus invade the plant community.

NATIVE PLANT COMMUNITY NO. 4

This plant community has moderately deep or deep soils that are gravelly fine sandy loams, fine sandy loams, sandy loams, or very fine sandy loams. Elevations range from 4,800 to 6,500 feet. Annual precipitation ranges from 7 to 10 inches.

This plant community is mainly grasses mixed with some shrubs and annual plants. It normally covers about 15 percent of the soil surface. Black grama, the dominant grass, is about 35 percent of the total vegetation by weight. Less abundant are sand dropseed, mesa dropseed, galleta, three-awn, blue grama, alkali sacaton, bush muhly, Indian ricegrass, and fluffgrass. In places there are broom snakeweed, broom dalea, pricklypear cactus, small soapweed, cholla cactus, winterfat, catclaw mimosa, and range ratany. Annual plants, which increase in years of above average precipitation, are tansymustard, Indian paintbrush, woolly Indian-wheat, lambsquarters, Russian-thistle, and bladderpod. Woody plants are in the drainageways. Apache-plume is the dominant shrub.

If this plant community is disturbed, annual plants increase. Sand dropseed becomes prominent, and cactus, catclaw mimosa, and broom snakeweed increase significantly.

NATIVE PLANT COMMUNITY NO. 5

This plant community is on the foot slopes on the west side of the Sandia Mountains. The soils are deep stony sandy loams. Elevations range from 6,000 to 7,000 feet. The annual precipitation ranges from 10 to 14 inches.

This plant community is a mixture of trees, shrubs, and understory plants. Oneseed juniper is common and gives the plant community an evergreen woodland aspect. Oakbrush is dominant among the abundant shrub plants. Less abundant are skunkbush sumac, sacahuista, range ratany, feather dalea, and rubber rabbitbrush. Apache-plume is common in drainageways and small soapweed, broom snakeweed, cholla cactus, and pricklypear cactus occur in small amounts. Black grama, the dominant grass, is about 25 percent of the total vegetation by weight. Less abundant are blue grama, hairy grama, bush muhly, bluegrass, New Mexico feathergrass, sand dropseed, three-awn, and bottlebrush squirreltail. Globemallow, groundsel, and brickellbush are the most prominent perennial forbs. Annual plants are Indian paintbrush, bladderpod, cheatgrass, six-weeks grama, lambsquarters, and fiddleneck.

If this plant community is disturbed, oneseed juniper and oakbrush become the most prominent plants and the understory is a few grasses and numerous annual plants.

NATIVE PLANT COMMUNITY NO. 6

This plant community has deep soils that are sandy loams or loamy fine sands. The soils are susceptible to severe soil blowing if the plant community is disturbed. Elevations range from 4,800 to 7,000 feet. Annual precipitation ranges from 7 to 14 inches.

This plant community is mainly grasses that cover approximately 15 percent of the soil surface. Indian ricegrass, the dominant plant, is about 50 percent of the total vegetation by weight. Less abundant are black grama, sand dropseed, spike dropseed, mesa dropseed, giant dropseed, bush muhly, New Mexico feathergrass, and galleta. Fourwing saltbush, winterfat, wolfberry, and Mormon-tea are the major shrubs. Small soapweed occurs in varying amounts. In years of above average precipitation, such annual plants as fiddleneck, daisy, loco, tansymustard, and verbena are conspicuous because of their colored flowers.

If this plant community is disturbed, annual plants and such woody plants as wolfberry, tea bush, and small soapweed increase. Sand dropseed and galleta also increase, and broom snakeweed, rubber rabbitbrush, and mesquite invade the plant community in places.

NATIVE PLANT COMMUNITY NO. 7

This plant community is on the west slope of the Sandia Mountains and on the east slope in the vicinity of San Antonito. The soils are very shallow to deep very fine sandy loams to extremely stony loams. Elevations range from 6,000 to 8,000 feet. Annual precipitation ranges from 10 to 18 inches.

This plant community covers about 25 percent of the soil surface. It is characterized by pinyon pine and oneseed juniper. Cottonwoods and willows grow along the water courses. Oakbrush is the dominant shrub. Less abundant are big sagebrush, rubber rabbitbrush, mountainmahogany, winterfat, fourwing saltbush, skunkbush sumac, and Apache-plume. Understory vegetation is primarily grasses. Side-oats grama is 25 to 50 percent of the total vegetation by weight, and blue grama is also abundant. Less abundant are western wheatgrass, black grama, galleta, bottlebrush squirreltail, needleandthread, New Mexico feathergrass, wolftail, sand dropseed, alkali sacaton, and bluegrass. Small soapweed, cholla cactus, pricklypear cactus, and agave generally occur.

If this site is disturbed, pinyon pine, oneseed juniper, alligator juniper, and oakbrush become the dominant vegetation. Blue grama, galleta, and broom snakeweed also increase, and annual plants become prominent.

NATIVE PLANT COMMUNITY NO. 8

This plant community is on the mesa west of the Rio Grande. The soils are shallow cobbly sandy loams. Elevations range from 5,200 to 5,800 feet. Annual precipitation ranges from 7 to 10 inches.

This plant community covers about 10 percent of the soil surface. It is mainly grasses. Galleta and black grama are about 50 percent of the total vegetation by weight. Less abundant are sand dropseed, spike dropseed, mesa dropseed, bottlebrush squirreltail, Indian ricegrass, bush muhly, silver bluestem, three-awn, blue grama, and side-oats grama. Fourwing saltbush, winterfat, and wolfberry are the dominant shrubs. Creosotebush, broom snakeweed, allthorn, and rubber rabbitbrush occur in places. Annual plants are loco, groundsel, fiddleneck, verbena, sunflower, lambsquarters, Russian-thistle, brickellbush, cheatgrass, and six-weeks grama.

If this plant community is disturbed, there is a decrease in black grama and bush muhly and an increase in galleta, sand dropseed, and annual plants.

NATIVE PLANT COMMUNITY NO. 9

This plant community is east of the Sandia and Manzano Mountains along the eastern border of Bernalillo County and in the northwest part of the survey area. The soils are very shallow to deep clay loams, very fine sandy loams, fine sandy loams, sandy loams, or loams. Elevations range from 5,400 to 8,000 feet. Annual precipitation ranges from 10 to 16 inches.

This plant community covers about 20 percent of the soil surface. It is mainly grasses. Blue grama, western wheatgrass, galleta, and black grama are dominant. Less abundant are three-awn, ring muhly, sand dropseed, side-oats grama, Indian ricegrass, needleandthread, and bottlebrush squirreltail. Broom snakeweed, small soapweed, cholla cactus, pricklypear cactus, winterfat, rubber rabbitbrush, and Russian-thistle are locally common. Indian paintbrush, loco, fiddleneck, six-weeks grama, and other annual plants are common in years of above average precipitation.

If this plant community is disturbed, three-awn, broom snakeweed, and ring muhly become dominant and cactus also increases. Blue grama persists, but its growth is reduced. Oneseed juniper invades the plant community in places.

NATIVE PLANT COMMUNITY NO. 10

The only soil in this plant community is Pino silt loam. It is moderately deep to bedrock. Elevations range from 7,400 to 8,000 feet. Annual precipitation ranges from 16 to 20 inches.

The natural vegetation is ponderosa pine, pinyon pine, and oneseed juniper. Associated grasses are blue grama and side-oats grama.

If this plant community is disturbed, there is an increase in oakbrush, wild rose, broom snakeweed, wild strawberry, American vetch, bottlebrush squirreltail, and mountain brome.

NATIVE PLANT COMMUNITY NO. 11

This plant community is on the sides of the Sandia, Manzanita, and Manzano Mountains. The soils are shallow to deep cobbly, stony or very stony, or gravelly loams. Elevations range from 8,000 to 9,500 feet. Annual precipitation ranges from 16 to 25 inches.

This plant community is mainly trees. Douglas-fir, white fir, ponderosa pine, and western maple are dominant. Associated grasses and shrubs are Arizona fescue, Kentucky bluegrass, pine dropseed, chokecherry, mockorange, western yarrow, wild strawberry, and lupine.

If this plant community is disturbed, there is an increase in quaking aspen, dwarf juniper, New Mexico locust, alder, oregongrape, American vetch, and Indian paintbrush.

NATIVE PLANT COMMUNITY NO. 12

This plant community is in the Sandia Mountains. The only soil is Kolob stony loam, cold variant, 15 to 40 percent slopes. Elevations range from 9,300 to 10,700 feet. Annual precipitation ranges from 25 to 30 inches.

This plant community is mainly Douglas-fir, white fir, and Engelmann spruce. Associated grasses and shrubs are Kentucky bluegrass, mountain brome, snowberry, and oregongrape.

If this plant community is disturbed, there is an increase in alder species, chokecherry, wild strawberry, American vetch, Indian paintbrush, dandelion, and larkspur.

NATIVE PLANT COMMUNITY NO. 13

This plant community is in an unprotected area next to the Rio Grande. The soils are deep and are dominantly sands, loamy sands, or sandy loams. They are subject to periodic flooding. Elevations range from about 4,900 to 5,000 feet. Annual precipitation ranges from 7 to 10 inches.

This riparian plant community is dominated by deciduous tree species through all successional stages. It is dependent upon the availability of abundant water, which results from seasonal river overflows or is permanent shallow ground waters associated with the Rio Grande.

The vegetation has characteristics associated with a past history of disturbance. The major disturbances occurred during floods, but man's influence through fire, grazing, water diversion and transport, and tree cutting has also changed the vegetation.

Rio Grande cottonwood is the dominant species. Following disturbances, Gooding willow, peachleaf willow, Russian-olive, screwbean mesquite, and cottonwood sprouts occupy the openings. On the wetter sites and bordering surface water areas, coyote willow forms dense thickets, which are semipermanent. Saltcedar occupies edges and disturbed areas and in places occurs as solid stands.

Forbs, woody shrubs, and such grasses as alkali sacaton and sand dropseed occur as a minor component of the older successional stages. Following disturbances, however, a great variety of herbaceous plants become established, reflecting an abundant seed source. Sunflower, alfalfa, sweetclover, and annual weeds temporarily grow on disturbed sites until a tree species dominates.

Woodland [5]

This section is helpful in selecting suitable species of trees, shrubs, ground cover plants, and vines for planting; in determining the water requirements of those plants; in landscaping; and in establishing windbreaks.

Successful planting is possible if—

1. All plants are protected from domestic animals and from rabbits, mice, and deer.
2. Supplemental water is provided during the establishment of plants, and structures that divert runoff during irrigation are used.
3. Competition from other plants for water, sunlight, and nutrients is eliminated, and the hazard of destruction by fire is reduced, preferably by cultivation.
4. Trees are protected from insects, disease, and parasites.
5. Proper varieties are selected, and proper planting procedures are followed, such as growing 1- or 2-year-old evergreens in pots.
6. Trees lost the first year are replaced as soon as possible to maintain a continuous barrier.
7. Pruning is limited to the removal of dead branches.

[5] CARY HULL, woodland specialist, Soil Conservation Service, helped prepare this section.

8. The growth rate and the lifespan of selected species are determined, possibly by the local nurseryman or the county agent.

Tables 3 and 4 list suitable trees, shrubs, ground cover plants, and vines for soil groups in the survey area. The soil grouping is based on soil temperature and other characteristics that affect growth and ability to withstand cold. Because the roots of trees grow chiefly in the lower layers of the soil, texture below the surface layer is considered in grouping the soils. Since texture of the surface layer and slope are not considered, the soils are grouped mostly by series rather than by mapping units.

The soil groups in tables 3 and 4 are described in the paragraphs that follow. Badland and Rock outcrop were not included because they are severely limited by shallowness to bedrock and steep to very steep slopes.

Soil Groups A–C.—The soils in these groups are deep and well drained and are gravelly sandy loam, fine sandy loam, silt loam, clay loam, or sandy clay loam below the surface layer. Roots penetrate to a depth of 20 to 60 inches. Permeability is moderately slow to moderately rapid. Where the surface layer is sandy loam, loamy sand, or loamy fine sand, plants need protection from windblown sand.

Group A soils are in the Rio Grande and Rio Puerco Valleys and on the East and West Mesas. The mean annual temperature is 58° to 60°. In this group are Agua, Anapra, Embudo, Gila, Glendale, Madurez, Pajarito, Tijeras, Tome, and Wink soils.

Group B soils are in the eastern and western parts of the survey area. The mean annual temperature is 47° to 55°. In this group are Kim, La Fonda, Manzano, Millett, Otero, Penistaja, Scholle, and Witt soils.

Group C soils are in the Sandia Mountains. The mean annual temperature is 43° to 45°. The Sandia soils are in this group. Borolls, which are shallow to deep and well drained and have a subsoil of stony sandy clay loam to very stony clay, are also included. Interpretations for tree and shrub planting are similar even though the soils are more variable.

Soil Groups D–E.—The soils in these groups are well drained and deep, except for the Pino soil, which is moderately deep. They are heavy clay loam, heavy silty clay loam, or clay below the surface layer. The clay commonly restricts downward movement of roots. Permeability is moderately slow to very slow.

Group D soils are in the Rio Grande and Rio Puerco Valleys and in the eastern and western parts of the survey area. The mean annual temperature is 47° to 60°. In this group are Armijo, Carlito, Hantz, and Silver soils.

Group E soils are in the Sandia Mountains. The mean annual temperature is 40° to 45°. In this group are Burnac, Kolob, and Pino soils and the Kolob variant.

Soil Group F.—The soils in this group are well drained to poorly drained and are silty clay loam to sand below the surface layer. A seasonal water table is at a depth of 30 to 60 inches. Permeability is moderate to very rapid. These soils are slightly to strongly saline or alkali, or both.

Group F soils are in the Rio Grande Valley. The mean annual temperature is 58° to 60°. In this group are the Agua variant and the frequently flooded Torrifluvents.

Soil Group G.—The soils in this group are deep and well drained to excessively drained and are sand, gravelly loamy sand, or loamy sand below the surface layer. They are commonly droughty. Permeability is moderately rapid to very rapid. Plants need protection from windblown sand and from removal of soil around the plant base by wind turbulence. They need to be watered often enough to keep the soil below the surface layer moist so that roots can penetrate deep into the soil.

Group G soils are in the Rio Grande and Rio Puerco Valleys and on the East and West Mesas. The mean annual temperature is 58° to 60°. In this group are Bluepoint, Brazito, Kokan, and Vinton soils. Cut and fill land is also included. It is sandy loam and very gravelly sand that has been mixed by filling for residential, industrial, and business developments. Drainage and permeability are variable.

Soil Groups H–I.—The soils in these groups are well drained and deep or moderately deep and are gravelly loam to light clay loam below the surface layer. Permeability is rapid to moderately slow.

Group H soils are east of the mountains. The mean annual temperature is 48° to 55°. In this group are Escabosa, Ildefonso, Salas, Seis, and Tesajo soils.

Group I soils are on the East and West Mesas. The mean annual temperature is 58° to 60°. In this group are Alemeda, Latene, and Nickel soils.

Soil Groups J–K.—The soils in these groups are well drained and are mostly shallow or very shallow to bedrock, except for Ustolls, which are shallow to deep. They are very stony and are steep or very steep. Permeability is slow to moderately rapid. These soils are poorly suited to many kinds of trees and shrub plantings because of the competition from native tree and brush species.

Group J soils are in the eastern and western parts of the survey area. The mean annual temperature is 49° to 55°. In this group are Bond, Laporte, Shingle, and Travessilla soils and Orthids and Ustolls.

Group K soils are on the West Mesa. The mean annual temperature is 58° to 60°. In this group are Akela soils.

Wildlife[6]

Wildlife, an important natural resource, is basically dependent upon the soils and is strongly influenced by man's use of the soils. The distribution of wildlife species can be related to certain land uses and to the production of specific types of vegetation. Land uses in this area are changing at a rapid rate as a result of current population growth. Past land uses and the present rate of development combine to influence the type, quantity, and quality of existing wildlife habitats.

Woodland habitats are at the higher elevations of the Sandia Mountains in the Cibola National Forest. These woodland habitats support shrubs, pinyon pine, juniper, and mixed conifers.

Wetland habitats are in manmade irrigation projects and in the bosques and freshwater marshes of the Rio Grande River, which provide habitat for a variety of wintering waterfowl and shorebirds. Large crow and raven populations roost along the river. This area has no natural lakes or ponds.

[6] By David E. Chalk, biologist, Soil Conservation Service.

TABLE 3.—*Suitable selected*

[Plants require frequent irrigation even after

Soil groups	Coniferous trees—		
	More than 30 feet	20 to 30 feet	Less than 20 feet
A	Italian cypress, ponderosa pine, Scotch pine, white fir.	Arizona cypress, Austrian pine,[1] Colorado blue spruce, ornamental arborvitae.	American arborvitae, bristlecone pine, eastern redcedar, Japanese black pine, pinyon pine,[2] Rocky Mountain juniper.[1]
B	Italian cypress, ponderosa pine,[1] Scotch pine, white fir.	Arizona cypress, Austrian pine,[1] Colorado blue spruce, ornamental arborvitae.	American arborvitae, eastern redcedar, Japanese black pine, pinyon pine,[2] Rocky Mountain juniper.[1]
C	Douglas-fir,[2] Engelmann spruce,[2] Italian cypress, ponderosa pine,[2] Scotch pine,[1] white fir.[2]	Austrian pine,[1] Colorado blue spruce,[1] ornamental arborvitae.	American arborvitae, bristlecone pine,[1] Japanese black pine, pinyon pine,[2] Rocky Mountain juniper.[2]
D	Italian cypress, white fir	Arizona cypress, Colorado blue spruce, ornamental arborvitae.	American arborvitae, eastern redcedar, Japanese black pine, pinyon pine,[1] Rocky Mountain juniper.[1]
E	Engelmann spruce, Italian cypress, white fir.[2]	Arizona cypress, Colorado blue spruce,[1] ornamental arborvitae.	American arborvitae, Japanese black pine, pinyon pine,[2] Rocky Mountain juniper.[2]
F	Italian cypress,[1] Scotch pine [1]	Arizona cypress,[1] Austrian pine,[1] Colorado blue spruce.[1]	Pinyon pine,[1] Rocky Mountain juniper.[1]
G	Italian cypress, ponderosa pine, Scotch pine, white fir.	Arizona cypress, Austrian pine,[1] ornamental arborvitae.	American arborvitae, bristlecone pine, eastern redcedar, Japanese black pine, pinyon pine,[1] Rocky Mountain juinper.[1]
H	Italian cypress, ponderosa pine,[1] Scotch pine, white fir.	Arizona cypress, Austrian pine,[1] ornamental arborvitae.	American arborvitae, eastern redcedar, Japanese black pine, pinyon pine,[1] Rocky Mountain juniper.[1]
I	Italian cypress, ponderosa pine, Scotch pine, white fir.	Arizona cypress, Austrian pine,[1] ornamental arborvitae.	American arborvitae, bristlecone pine, eastern redcedar, Japanese black pine, pinyon pine,[2] Rocky Mountain juniper.[1]
J	Italian cypress, ponderosa pine,[1] Scotch pine, white fir.	Arizona cypress, Austrian pine,[1] ornamental arborvitae.	American arborvitae, Japanese black pine, pinyon pine.[1]
K	Italian cypress, ponderosa pine, Scotch pine, white fir.	Arizona cypress, Austrian pine,[1] ornamental arborvitae.	American arborvitae, bristlecone pine, Japanese black pine, pinyon pine.[1]

[1] Plants require infrequent irrigation after establishment. During extended periods of drought more frequent irrigation helps plants to grow vigorously.

Rangeland habitats reflect the moisture regime and the long history of livestock grazing. The plant communities in the Sandia foothills are complex and have local value as browse for mule deer.

Croplands are restricted to those areas where irrigation water is available. Hay and grain crops are an important source of feed for mourning dove and scaled quail and to some extent for pheasant.

Important game species include Rocky Mountain bighorn sheep, mule deer, turkey, scaled quail, Gambel's quail, antelope, and mourning dove. Nongame species include cottontail rabbit, coyote, chipmunk, bobcat, ground squirrel, prairie dog, raven, raccoon, and road runner. There is a large population of resident and migratory songbirds. The New Mexico Department of Game and Fish stocks trout in several irrigation drains during the winter. These drains, as well as Sawmill Pond and Tingley Beach, provide warm-water fishing from April to November and trout fishing in winter.

Table 5 rates the soils according to their suitability

trees, by soil groups

establishment except where noted]

Deciduous trees—		
More than 30 feet	20 to 30 feet	Less than 20 feet
American sycamore, Arizona sycamore, Fremont cottonwood, Lombardy poplar, narrowleaf cottonwood, red mulberry, Sargent cottonwood.	Black locust,[1] catalpa, flowering crab, globe willow, golden willow, green ash, Russian-olive,[1] Siberian elm,[2] standard apple, weeping willow.	Eastern redbud, flowering apricot, golden-rain-tree, hawthorn, mimosa, ornamental pear, white mulberry.[1]
American sycamore, Arizona sycamore, Fremont cottonwood, Lombardy poplar, narrowleaf cottonwood, red mulberry, Sargent cottonwood.	Black locust, catalpa, flowering crab, globe willow, golden willow, green ash, Russian-olive,[2] Siberian elm,[2] standard apple, weeping willow.	Eastern redbud, flowering apricot, golden-rain-tree, hawthorn, mimosa, ornamental pear, white mulberry.
American sycamore, Fremont cottonwood, Lombardy poplar, narrowleaf cottonwood, red mulberry, Sargent cottonwood.	Catalpa,[1] flowering crab,[1] golden willow, green ash,[2] Siberian elm,[2] standard apple.[1]	Eastern redbud,[1] flowering apricot,[1] golden-rain-tree, hawthorn, mimosa, ornamental pear,[1] white mulberry.[2]
American sycamore, Arizona sycamore, Fremont cottonwood, Lombardy poplar, narrowleaf cottonwood, red mulberry, Sargent cottonwood.	Black locust, flowering crab, globe willow, golden willow, green ash, Russian-olive,[1] Siberian elm,[2] standard apple, weeping willow.	Eastern redbud, flowering apricot, golden-rain-tree, hawthorn, mimosa, ornamental pear, white mulberry.
American sycamore, Fremont cottonwood, Lombardy poplar, narrowleaf cottonwood, red mulberry, Sargent cottonwood.	Flowering crab,[1] golden willow, green ash,[2] Siberian elm,[2] standard apple.[1]	Eastern redbud,[2] flowering apricot,[1] golden-rain-tree, hawthorn, mimosa, ornamental pear,[1] white mulberry.[2]
Arizona sycamore,[1] Lombardy poplar,[1] red mulberry,[1] Rio Grande cottonwood.[1]	Globe willow,[1] golden willow,[1] green ash,[1] Russian-olive,[1] Siberian elm,[1] weeping willow.[1]	Golden-rain-tree,[1] hawthorn,[1] ornamental pear,[1] white mulberry.[1]
Arizona sycamore, Fremont cottonwood, Lombardy poplar, narrowleaf cottonwood, red mulberry, Sargent cottonwood.	Black locust,[1] flowering crab, globe willow, golden willow, green ash, Russian-olive,[1] Siberian elm,[1] standard apple, weeping willow.	Eastern redbud, flowering apricot, golden-rain-tree, hawthorn, ornamental pear, white mulberry.[1]
Arizona sycamore, Fremont cottonwood, Lombardy poplar, narrowleaf cottonwood, red mulberry, Sargent cottonwood.	Black locust, flowering crab, globe willow, golden willow, Russian-olive,[1] Siberian elm,[2] standard apple, weeping willow.	Flowering apricot, golden-rain-tree, hawthorn, ornamental pear, white mulberry.
Arizona sycamore, Fremont cottonwood, Lombardy poplar, narrowleaf cottonwood, red mulberry, Sargent cottonwood.	Black locust,[1] flowering crab, globe willow, golden willow, green ash, Russian-olive,[1] Siberian elm,[2] standard apple, weeping willow.	Flowering apricot, golden-rain-tree, hawthorn, ornamental pear, white mulberry.[2]
Red mulberry	Russian-olive,[1] Siberian elm [1]	Golden-rain-tree, hawthorn, white mulberry.
Red mulberry	Russian-olive,[1] Siberian elm [1]	Golden-rain-tree, hawthorn, ornamental pear, white mulberry.[1]

[2] Plants are suited to dryland after establishment with irrigation. Engineering structures can be used to divert runoff for supplemental water.

for improving, maintaining, or creating specific elements of wildlife habitat as well as for general kinds of wildlife. Ratings are based on potential rather than present land use. A rating of *good* means that habitat is easily improved, maintained, or created. There are few or no soil limitations to habitat management, and satisfactory results can be expected. *Fair* means that habitat can be improved, maintained, or created, but moderate soil limitations affect habitat management or development. Moderately intense management and fairly frequent attention may be required to insure satisfactory results. *Poor* means that habitat can be improved, maintained, or created, but the soil limitations are severe. Habitat management can be difficult and expensive and can require intensive efforts. Results are questionable. *Very poor* means that, under the prevailing soil conditions, it is impractical to attempt to improve, maintain, or create habitat. Unsatisfactory results are probable.

The specific elements of wildlife habitat are described in the following paragraphs.

TABLE 4.—*Suitable selected shrubs,*

[Plants require frequent irrigation even

Soil groups	Evergreen shrubs—			Deciduous shrubs—
	More than 8 feet	4 to 8 feet	Less than 4 feet	More than 8 feet
A	Juniper pfitzer, pyracantha.	Cotoneaster glancophyua, evergreen euonymus, mugho pine.	Cotoneaster microphylla, creeping juniper.	American plum, Amur honeysuckle, desert willow,[2] giant reed, lilac, redberried cotoneaster, tamarisk, Tartarian honeysuckle, winterberry eunonymus.
B	Juniper pfitzer, pyracantha.	Cotoneaster glancophyua, evergreen euonymus, mugho pine.	Cotoneaster microphylla,[1] creeping juniper.	American plum, Amur honeysuckle, lilac, redberried cotoneaster, tamarisk,[1] Tartarian honeysuckle, winterberry euonymus.
C	Juniper pfitzer[1]	Mugho pine	Cotoneaster microphylla,[1] creeping juniper.[1]	American plum,[1] Amur honeysuckle,[2] lilac, red-berried cotoneaster,[1] Tartarian honeysuckle, winterberry euonymus.[2]
D	Juniper pfitzer, pyracantha.	Cotoneaster glancophyua, evergreen euonymus, mugho pine.	Cotoneaster microphylla,[1] creeping juniper.	American plum, Amur honeysuckle, lilac, red-berried cotoneaster, tamarisk,[1] Tartarian honeysuckle, winterberry euonymus.
E	Juniper pfitzer[1]	Mugho pine	Cotoneaster microphylla,[1] creeping juniper.[1]	American plum,[1] Amur honeysuckle,[1] lilac, red-berried cotoneaster,[1] Tartarian honeysuckle, winterberry euonymus.[2]
F	Pyracantha[1]	Cotoneaster glancophyua,[1] evergreen euonymus.[1]	Cotoneaster microphylla.[1]	Amur honeysuckle,[1] giant reed,[1] tamarisk,[1] winterberry euonymus.[1]
G	Juniper pfitzer, pyracantha.	Cotoneaster glancophyua, evergreen euonymus, mugho pine.	Cotoneaster microphylla, creeping juniper.	Amur honeysuckle, desert willow,[1] redberried cotoneaster, tamarisk, Tartarian honeysuckle, winterberry euonymus.
H	Juniper pfitzer, pyracantha.	Cotoneaster glancophyua, evergreen euonymus, mugho pine.	Cotoneaster microphylla,[1] creeping juniper.	Amur honeysuckle, red-berried cotoneaster, tamarisk,[1] Tartarian honeysuckle, winterberry euonymus.
I	Juniper pfitzer, pyracantha.	Cotoneaster glancophyua, evergreen euonymus, mugho pine.	Cotoneaster microphylla, creeping juniper.	Amur honeysuckle, desert willow,[2] redberried cotoneaster, tamarisk, Tartarian honeysuckle, winterberry euonymus.
J	Juniper pfitzer	Cotoneaster glancophyua, mugho pine.	Cotoneaster microphylla,[1] creeping juniper.	American plum, Amur honeysuckle, redberried cotoneaster, Tartarian honeysuckle, winterberry euonymus.
K	Juniper pfitzer	Cotoneaster glancophyua, mugho pine.	Cotoneaster microphylla,[1] creeping juniper.	American plum, Amur honeysuckle, red-berried cotoneaster, Tartarian honeysuckle, winterberry euonymus.

[1] Plants require infrequent irrigation after establishment. During extended periods of drought more frequent irrigation helps plants to grow vigorously.

Grain and seed crops are domestic grains or other seed-producing annuals that are planted to provided food for wildlife. Examples are corn, sorghum, oats, barley, rye, millet, and sunflower.

Domestic grasses and legumes are perennial grasses and herbaceous legumes that are planted to provide food and cover for wildlife. Examples are switchgrass, orchardgrass, smooth brome, tall wheatgrass, clover, alfalfa, and bermudagrass.

Wild herbaceous plants are native or established rangeland grasses and forbs that provide food and cover for wildlife. Examples are gramagrass, Indian ricegrass, alkali sacaton, galleta, dropseed, saltgrass, globemallow, woolly Indian-wheat, Russian-thistle, lambsquarters, and broom snakeweed.

Coniferous plants[7] are cone-bearing trees, shrubs, or

[7] Only eight mapping units have been rated for coniferous plants and woodland wildlife. These ratings are in footnotes at the end of table 5.

ground cover plants, and vines

after establishment except where noted]

Deciduous shrubs—Continued		Ground cover plants	Vines
4 to 8 feet	Less than 4 feet		
Autumn-olive, forsythia, Japanese barberry, silver buffaloberry, skunkbush sumac.[2]	Sand cherry	Rocky Mountain penstemon	Grape, Halls honeysuckle, Virginia creeper, western virgins-bower.
Autumn-olive, forsythia, Japanese barberry, skunkbush sumac.[2]	Sand cherry	Rocky Mountain penstemon	Grape, Halls honeysuckle, Virginia creeper, western virgins-bower.
Autumn-olive,[1] forsythia,[1] Japanese barberry, silver buffaloberry,[2] skunkbush sumac.[2]	Sand cherry	Bearberry, Rocky Mountain penstemon.[2]	Grape, Halls honeysuckle,[1] Virginia creeper,[1] western virgins-bower.[1]
Autumn-olive, forsythia, Japanese barberry, skunkbush sumac.[2]	----------	Rocky Mountain penstemon	Grape, Halls honeysuckle, Virginia creeper, western virgins-bower.
Autumn-olive,[1] forsythia,[1] Japanese barberry, silver buffaloberry,[2] skunkbush sumac.[2]	----------	Bearberry, Rocky Mountain penstemon.[2]	Grape, Halls honeysuckle,[1] Virginia creeper,[1] western virgins-bower.[1]
Autumn-olive,[1] Japanese barberry,[1] silver buffaloberry,[1] skunkbush sumac.[1]	----------	Rocky Mountain penstemon [1]	Grape,[1] Halls honeysuckle.[1]
Autumn-olive, forsythia, skunkbush sumac.[1]	----------	Rocky Mountain penstemon	Halls honeysuckle, Virginia creeper, western virgins-bower.
Autumn-olive, forsythia, skunkbush sumac.[2]	----------	Rocky Mountain penstemon	Halls honeysuckle, Virginia creeper, western virgins-bower.
Autumn-olive, forsythia, skunkbush sumac.[2]	----------	Rocky Mountain penstemon	Halls honeysuckle, Virginia creeper, western virgins-bower.
Autumn-olive, forsythia, skunkbush sumac.[1]	Sand cherry	Rocky Mountain penstemon	Halls honeysuckle, Virginia creeper, western virgins-bower.
Autumn-olive, forsythia, skunkbush sumac.[1]	Sand cherry	Rocky Mountain penstemon	Halls honeysuckle, Virginia creeper, western virgins-bower.

[2] Plants are suited to dryland after establishment with irrigation. Engineering structures can be used to divert runoff for supplemental water.

ground cover plants that provide cover for wildlife or supply food in the form of browse, seeds, or fruitlike cones. Examples are ponderosa pine, pinyon pine, juniper, white fir, and Douglas-fir.

Shrubs are native or established woody shrubs that provide cover for wildlife or supply food in the form of browse or mast. Examples are fourwing saltbush, mountainmahogany, skunkbush sumac, mesquite, oakbrush, fringed sagebrush, and small soapweed.

Wetland plants are annual and perennial wild herbaceous plants, exclusive of submerged or floating aquatics, in moist to wet areas. They provide food and cover for wetland wildlife. Examples are smartweed, wild millet, rushes, sedges, and cattail.

Shallow water areas are natural or constructed areas of shallow water that average less than 5 feet deep. Examples are marshes, flooded cropfields, wildlife watering developments, and wildlife ponds.

The criteria used in rating soils for these elements of wildlife habitat include depth of soil to bedrock, soil

TABLE 5.—*Wildlife*

Symbols and mapping units	Potential for habitat elements		
	Grain and seed crops	Domestic grasses and legumes	Wild herbaceous plants
Af—Agua loam	Good	Good	Good
Ag—Agua silty clay loam	Good	Good	Good
Ah—Agua loam, wet variant	Poor	Poor	Poor
AkC—Akela-Rock outcrop complex, 1 to 9 percent slopes	Very poor	Very poor	Poor
AmB—Alemeda sandy loam, 0 to 5 percent slopes	Very poor	Very poor	Fair
An—Anapra silt loam	Good	Good	Fair
Ao—Anapra silty clay loam	Good	Good	Fair
Ar—Armijo clay loam	Fair	Good	Fair
Ba—Badland	Very poor	Very poor	Very poor
Bb—Bluepoint fine sand, hummocky	Very poor	Very poor	Poor
BcA—Bluepoint loamy fine sand, 1 to 3 percent slopes	Poor	Fair	Good
BCC—Bluepoint loamy fine sand, 1 to 9 percent slopes	Very poor	Very poor	Poor
Bd3—Bluepoint-Wink, severely eroded complex	Very poor	Very poor	Poor
BKD—Bluepoint-Kokan association, hilly	Very poor	Very poor	Poor
BOF—Borolls-Rock outcrop association, very steep [1]	Very poor	Very poor	Poor
Br—Brazito fine sandy loam	Fair	Good	Poor
Bs—Brazito silty clay loam	Fair	Good	Poor
Bt—Brazito complex	Fair	Good	Poor
BUE—Burnac gravelly loam, 20 to 60 percent slopes [2]	Poor	Poor	Good
CAF—Carlito complex, 15 to 80 percent slopes	Poor	Fair	Fair
Cu—Cut and fill land	Poor	Poor	Poor
EmB—Embudo gravelly fine sandy loam, 0 to 5 percent slopes	Very poor	Very poor	Poor
EtC—Embudo-Tijeras complex, 0 to 9 percent slopes	Very poor	Very poor	Poor
GA—Gila fine sandy loam	Very poor	Very poor	Poor
Gb—Gila loam	Good	Good	Poor
Gc—Gila loam, slightly saline	Good	Good	Poor
Gd—Gila loam, moderately alkali	Fair	Fair	Poor
Ge—Gila clay loam	Good	Good	Poor
GF—Gila complex, moderately alkali	Very poor	Very poor	Poor
GH—Gila-Hantz complex	Very poor	Very poor	Poor
Gk—Glendale loam	Good	Good	Poor
Gm—Glendale clay loam	Good	Good	Poor
Gs—Glendale clay loam, slightly saline	Good	Good	Poor
Ha—Hantz silty clay loam	Very poor	Very poor	Poor
ILC—Ildefonso gravelly sandy loam, 1 to 9 percent slopes	Very poor	Very poor	Fair
KaB—Kim fine sandy loam, 1 to 8 percent slopes	Very poor	Very poor	Fair
KbB—Kim silty clay loam, 3 to 5 percent slopes	Very poor	Very poor	Fair
KD—Kim-Badland association	Very poor	Very poor	Poor
KOE—Kokan gravelly sand, 10 to 40 percent slopes	Very poor	Very poor	Poor
KR—Kokan-Rock outcrop association	Very poor	Very poor	Poor
KS—Kolob stony loam [3]	Very poor	Very poor	Fair
KT—Kolob-Rock outcrop association [3]	Very poor	Very poor	Fair
KU—Kolob-Sandia association [3]	Very poor	Very poor	Fair
KVE—Kolob stony loam, cold variant, 15 to 40 percent slopes [3]	Very poor	Very poor	Good
La—La Fonda loam	Poor	Fair	Fair
LBE—Laporte-Rock outcrop complex, 20 to 45 percent slopes	Very poor	Very poor	Fair
LRD—Laporte-Rock outcrop-Escabosa complex, 5 to 20 percent slopes.	Very poor	Very poor	Fair
LtB—Latene sandy loam, 1 to 5 percent slopes	Very poor	Very poor	Poor
MaB—Madurez loamy fine sand, 1 to 5 percent slopes	Very poor	Very poor	Poor
MbC—Madurez-Bluepoint complex, 1 to 9 percent slopes	Very poor	Very poor	Poor
MWA—Madurez-Wink association, gently sloping	Very poor	Very poor	Poor
MWB—Madurez-Wink association, undulating	Very poor	Very poor	Poor
Mz—Manzano loan	Poor	Fair	Fair
NL—Nickel-Latene association	Very poor	Very poor	Poor
OT—Otero fine sandy loam	Very poor	Very poor	Fair
PAC—Pajarito loamy fine sand, 1 to 9 percent slopes	Very poor	Very poor	Poor
PbB—Pajarito fine sandy loam, 1 to 5 percent slopes	Very poor	Very poor	Poor
PEB—Penistaja loamy fine sand, 1 to 5 percent slopes	Very poor	Very poor	Fair
PFB—Penistaja fine sandy loam, 1 to 5 percent slopes	Poor	Poor	Fair
PG—Penistaja-Bond association	Poor	Poor	Fair
PR—Pino-Rock outcrop association [4]	Very poor	Very poor	Good
Ra—Rock outcrop	Very poor	Very poor	Poor
RBE—Rock outcrop-Akela complex, 10 to 50 percent slopes	Very poor	Very poor	Poor
RCE—Rock outcrop-Bond complex, 5 to 35 percent slopes	Very poor	Very poor	Poor
RLF—Rock outcrop-Laporte complex, 30 to 80 percent slopes	Very poor	Very poor	Fair
ROF—Rock outcrop-Orthids complex, 40 to 80 percent slopes	Very poor	Very poor	Fair
RUF—Rock outcrop-Ustolls complex, 15 to 70 percent slopes	Very poor	Very poor	Poor

See footnotes at end of table.

habitat

Potential for habitat elements—Continued			Potential for kinds of wildlife		
Shrubs	Wetland plants	Shallow water areas	Openland	Wetland	Rangeland
Good	Good	Fair	Good	Fair	Good.
Good	Good	Fair	Good	Fair	Good.
Poor	Good	Fair	Poor	Fair	Poor.
Fair	Very poor	Very poor	Very poor	Very poor	Poor.
Fair	Very poor	Very poor	Poor	Very poor	Poor.
Fair	Good	Fair	Good	Fair	Fair.
Fair	Good	Fair	Good	Fair	Fair.
Fair	Good	Good	Fair	Good	Fair.
Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Fair	Very poor	Very poor	Very poor	Very poor	Poor.
Good	Very poor	Very poor	Fair	Very poor	Good.
Fair	Very poor	Very poor	Very poor	Very poor	Poor.
Fair	Very poor	Very poor	Very poor	Very poor	Poor.
Fair	Very poor	Very poor	Very poor	Very poor	Poor.
Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Poor	Good	Good	Fair	Good	Poor.
Fair	Good	Good	Fair	Good	Poor.
Fair	Good	Good	Fair	Good	Poor.
Good	Very poor	Very poor	Fair	Very poor	Poor.
Fair	Very poor	Very poor	Fair	Very poor	Fair.
Fair	Very poor	Very poor	Poor	Very poor	Poor.
Poor	Poor	Very poor	Very poor	Very poor	Poor.
Poor	Poor	Very poor	Very poor	Very poor	Poor.
Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Poor	Good	Good	Fair	Good	Poor.
Poor	Poor	Good	Fair	Fair	Poor.
Very poor	Fair	Good	Poor	Fair	Very poor.
Poor	Good	Good	Fair	Good	Poor.
Poor	Fair	Good	Very poor	Fair	Poor.
Poor	Poor	Very poor	Very poor	Very poor	Poor.
Poor	Good	Good	Fair	Good	Poor.
Poor	Good	Good	Fair	Good	Poor.
Poor	Fair	Good	Fair	Fair	Poor.
Poor	Poor	Poor	Very poor	Poor	Poor.
Fair	Poor	Very poor	Poor	Very poor	Fair.
Fair	Poor	Very poor	Poor	Poor	Fair.
Fair	Poor	Very poor	Poor	Poor	Fair.
Poor	Very poor	Very poor	Poor	Very poor	Very poor.
Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Fair	Very poor	Very poor	Poor	Very poor	Fair.
Fair	Very poor	Very poor	Poor	Very poor	Fair.
Fair	Very poor	Very poor	Poor	Very poor	Fair.
Good	Very poor	Very poor	Poor	Very poor	
Fair	Poor	Very poor	Fair	Very poor	Fair.
Fair	Very poor	Very poor	Poor	Very poor	Fair.
Fair	Very poor	Very poor	Poor	Very poor	Fair.
Poor	Poor	Very poor	Very poor	Very poor	Poor.
Poor	Poor	Very poor	Very poor	Very poor	Poor.
Poor	Poor	Very poor	Very poor	Very poor	Poor.
Poor	Poor	Very poor	Very poor	Very poor	Poor.
Poor	Poor	Very poor	Very poor	Very poor	Poor.
Fair	Poor	Very poor	Fair	Very poor	Fair.
Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Fair	Poor	Very poor	Poor	Very poor	Fair.
Poor	Poor	Very poor	Very poor	Very poor	Poor.
Poor	Poor	Very poor	Very poor	Very poor	Poor.
Fair	Poor	Very poor	Poor	Very poor	Fair.
Fair	Poor	Very poor	Poor	Very poor	Fair.
Fair	Poor	Very poor	Poor	Very poor	Fair.
	Very poor	Very poor	Poor	Very poor	
Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Fair	Very poor	Very poor	Poor	Very poor	Fair.
Fair	Very poor	Very poor	Poor	Very poor	Fair.
Poor	Very poor	Very poor	Poor	Very poor	Poor.

TABLE 5.—*Wildlife*

Symbols and mapping units	Potential for habitat elements		
	Grain and seed crops	Domestic grasses and legumes	Wild herbaceous plants
SAF—Salas complex, 20 to 80 percent slopes	Very poor	Very poor	Fair
SBE—Sandia-Kolob complex, 15 to 40 percent slopes[1]	Poor	Poor	Good
SC—Scholle-Ildefonso association	Very poor	Very poor	Fair
SEC—Seis very cobbly loam, 0 to 15 percent slopes	Very poor	Very poor	Fair
SFE—Seis stony loam, 15 to 60 percent slopes	Very poor	Very poor	Fair
SGE—Seis-Silver complex, 10 to 40 percent slopes	Very poor	Very poor	Fair
SHF—Seis complex, 30 to 80 percent slopes	Very poor	Very poor	Fair
SkE—Shingle-Badland complex, eroded, 2 to 40 percent slopes	Very poor	Very poor	Poor
SL—Shingle, eroded-Kim association	Very poor	Very poor	Poor
SmA—Silver fine sandy loam, 0 to 2 percent slopes	Very poor	Very poor	Fair
SnA—Silver fine sandy loam, moderately alkali, 0 to 2 percent slopes.	Very poor	Very poor	Fair
SwB—Silver and Witt soils, 2 to 5 percent slopes	Poor	Fair	Fair
SwC—Silver and Witt soils, 5 to 9 percent slopes	Poor	Fair	Fair
Te—Tesajo-Millett stony sandy loams	Poor	Poor	Fair
TgB—Tijeras gravelly fine sandy loam, 1 to 5 percent slopes	Very poor	Very poor	Poor
To—Tome very fine sandy loam	Very poor	Very poor	Good
TP—Torrifluvents, frequently flooded	Very poor	Very poor	Good
TQC—Travessilla fine sandy loam, 1 to 15 percent slopes	Very poor	Very poor	Fair
TR—Travessilla-Rock outcrop association	Very poor	Very poor	Fair
Va—Vinton loamy sand	Fair	Fair	Poor
VbA—Vinton sandy loam, 0 to 1 percent slopes	Fair	Fair	Poor
VBB—Vinton sandy loam, 1 to 3 percent slopes	Very poor	Very poor	Poor
Vc—Vinton clay loam	Good	Good	Poor
VF—Vinton and Brazito soils, occasionally flooded	Very poor	Very poor	Good
WaB—Wink fine sandy loam, 0 to 5 percent slopes	Very poor	Very poor	Poor
WeB—Wink-Embudo complex, 0 to 5 percent slopes	Very poor	Very poor	Poor
WM—Wink-Madurez association	Very poor	Very poor	Poor

[1] Poor suitability for coniferous plants and woodland wildlife habitat.
[2] Good suitability for coniferous plants and woodland wildlife habitat.

texture, available water capacity, drainage class, frequency of flooding, number of rock fragments, slope, salinity or alkalinity, and moisture regime.

Table 5 also rates the soils according to their suitability for producing the essential elements of habitat required for three general types of wildlife. A weighted factor was assigned to selected habitat elements to arrive at a suitability rating. The general types of wildlife are described in the following paragraphs.

Openland wildlife are birds and mammals that normally frequent croplands, pastures, meadows, and other types of farmland. Examples are scaled quail, Gambel's quail, mourning dove, ring-necked pheasant, cottontail rabbit, skunk, and Western kingbird. Considered in rating are grain and seed crops, domestic grasses and legumes, wild herbaceous plants, and shrubs.

Wetland wildlife are birds and mammals that normally frequent swamp, marsh, riparian areas and open water areas. Examples are ducks, geese, shore birds, great blue heron, muskrat, beaver, and marsh wren. Considered in rating are wetland plants and shallow water areas.

Rangeland wildlife are birds and mammals that normally frequent natural grasslands, shrublands, and pinyon-juniper areas. Examples are scaled quail, burrowing owl, marsh hawk, brown towhee, meadowlark, jackrabbit, mule deer, pronghorn antelope, kangaroo rat, and prairie dog. Considered in rating are wild herbaceous plants and shrubs.

Woodland wildlife[7] are birds and mammals that normally frequent wooded areas and high mountains that have coniferous trees and shrubs. Examples are Rocky Mountain bighorn sheep, mule deer, turkey, bobcat, Steller's jay, broad-tailed hummingbird, and ground squirrel.

Timber[8]

This section presents information about the suitability of the soils for production of timber and other wood products. In this area the soils that support commercial timber and woodland are mainly those at higher elevations on the Sandia, Manzanita, and Manzano Mountians in the Cibola National Forest and on the Isleta Indian Reservation. Although a narrow belt of timber is along the western side of the Sandia Mountains, the primary timber-producing area is on the eastern side. Only those soils in forested or wooded areas are discussed in this section.

Timber has been harvested in the area for many years. Recent harvesting has been to remove decadent, over-

[8] By J. OWEN CARLETON and JOHN A. WILLIAMS, soil scientists, Forest Service.

habitat—Continued

Potential for habitat elements—Continued			Potential for kinds of wildlife		
Shrubs	Wetland plants	Shallow water areas	Openland	Wetland	Rangeland
Fair	Very poor	Very poor	Poor	Very poor	Fair.
Fair	Very poor	Very poor	Fair	Very poor	Fair.
Fair	Poor	Very poor	Poor	Very poor	Fair.
Fair	Very poor	Very poor	Poor	Very poor	Fair.
Fair	Very poor	Very poor	Poor	Very poor	Fair.
Fair	Very poor	Very poor	Poor	Very poor	Fair.
Fair	Very poor	Very poor	Poor	Very poor	Fair.
Poor	Very poor	Very poor	Poor	Very poor	Poor.
Poor	Poor	Very poor	Very poor	Very poor	Poor.
Fair	Poor	Very poor	Fair	Very poor	Fair.
Fair	Poor	Very poor	Fair	Very poor	Fair.
Fair	Poor	Very poor	Poor	Very poor	Fair.
Fair	Poor	Very poor	Poor	Very poor	Fair.
Fair	Poor	Very poor	Poor	Very poor	Fair.
Poor	Poor	Very poor	Very poor	Very poor	Poor.
Poor	Poor	Very poor	Poor	Very poor	Fair.
Good	Good	Good	Poor	Good	Good.
Fair	Poor	Very poor	Poor	Very poor	Fair.
Fair	Poor	Very poor	Poor	Very poor	Fair.
Poor	Poor	Good	Fair	Fair	Poor.
Poor	Poor	Good	Fair	Fair	Poor.
Poor	Poor	Very poor	Very poor	Very poor	Poor.
Poor	Poor	Good	Fair	Fair	Poor.
Good	Good	Good	Poor	Good	Good.
Poor	Poor	Very poor	Very poor	Very poor	Poor.
Poor	Poor	Very poor	Very poor	Very poor	Poor.
Poor	Poor	Very poor	Very poor	Very poor	Poor.

[3] Fair suitability for coniferous plants and woodland wildlife habitat.
[4] Good suitability for coniferous plants and fair for woodland wildlife habitat.

mature trees to maintain the health and vigor of the residual stands and lessen their susceptibility to insects and disease. About one-half of the total commercial forest land is classed as cutover and the other one-half as virgin. Only about one-third of the trees are larger than 20 inches in diameter at breast height.

Ponderosa pine, Douglas-fir, white fir, and Engelmann spruce are the commercial timber species. Douglas-fir and white fir make up about 60 percent of the commercial timber, but aspen stands are common.

In this area ponderosa pine grows best at elevations that range from 7,500 to 8,500 feet and to 9,500 feet on south-facing slopes. It grows well on Burnac, Kolob, Pino, and Sandia soils. Laporte soils support ponderosa pine at higher elevations. Douglas-fir and white fir are at elevations that range from 8,000 feet on north-facing slopes to 10,400 feet on south-facing slopes. They grow best on the Kolob and Sandia soils at the higher elevations. Engelmann spruce grows on the Kolob variant at elevations of 9,500 feet or more.

At elevations of 5,300 to 7,800 feet, the tree cover is mostly pinyon pine and juniper. These species also are common on south-facing slopes at elevations as high as 8,500 feet. They grow best on Bond, Carlito, Escabosa, Ildefonso, Laporte, Salas, Seis, Silver, and Witt soils. They have commercial value as fence posts, mine props, and fuel wood. They are also used in ornamental landscaping. Pinyon pine produces edible nuts and is good as a Christmas tree.

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Timber suitability groups

Table 6 groups the forested soils in order of their estimated suitability for timber. Ratings are given for five groups of soils. The soils in group 1 are those that are the most productive for ponderosa pine, Douglas-fir, and white fir. Those in group 4 are the least productive. The soils in group 1 produce trees that grow quickly and have good quality and form. Those in group 5 produce trees that grow slowly and have poor form.

Table 6 shows the estimated suitability for ponderosa pine, Douglas-fir, and white fir. Suitability for Engelmann spruce and corkbark fir is shown where it applies to a particular group of soils. These ratings are based not only on site index, but also on field observations and experience of soil scientists, forest rangers, and forest technicians. The timber suitability groups described in the table apply only to this survey area.

Table 6 also shows ratings for plant completion, equipment limitations, and the hazard of erosion.

The windthrow hazard is not significant in this area and is not shown in the table. Some damage may occur if high-velocity winds strike timbered areas when the soil is saturated. Trees on shallow soil are the most susceptible.

TABLE 6.—*Timber*

[Only soils managed chiefly for commerical forest

Timber suitability group, soil series, and map symbols	Site index [1]	Suitable species
Group 1: Deep, medium textured to moderately fine textured, moderately steep to steep, well drained stony soils on mountainsides. Moderate permeability. Sandia: SBE.	70+	Ponderosa pine, Douglas-fir, white fir
Group 2: Moderately deep to deep, fine textured, gently sloping to steep, well drained stony soils on mountainsides. Moderately slow to slow permeability. Rock outcrop. Kolob: KS, KT. Pino: PR.	64–69	Ponderosa pine, Douglas-fir, white fir
Group 3: Deep, fine textured, moderately steep to steep, well drained very stony soils on mountainsides. Slow permeability. Rock outcrop. Kolob variant: KVE.	64–69	Engelmann spruce, corkbark fir
Group 4: Deep, fine textured, moderately steep to very steep, well drained stony and very stony soils on mountainsides. Moderately slow to very slow permeability. Burnac: BUE. Kolob: KU.	57–63	Ponderosa pine, Douglas-fir, white fir
Group 5: Very shallow to deep, steep to very steep stony to very stony loamy soils. Rock outcrop. Borolls: BOF. Laporte part of Rock outcrop: RLF.	54 or less	Ponderosa pine, Douglas-fir, white fir

[1] Site index refers to the height of dominant and codominant trees at 100 years of age.

Plant competition is the invasion of undesirable plants. When a site has been disturbed by fire, cutting, or other factors, undesirable species of brush, trees, and other plants are apt to invade. Such competition hinders the establishment and growth of desirable tree species.

A rating of *slight* indicates that invasion by undesirable species will have little effect on growth or reestablishment of desirable timber species. *Moderate* indicates that competition will not seriously affect establishment of adequate stands of timber. *Severe* indicates that competition interferes with natural regeneration and that competing species must be controlled if seedlings are planted.

In this area Gambel oak is the chief source of competition. Thick stands grow in burned or cutover areas of Kolob and Sandia soils.

Equipment limitations are soil characteristics and topographic features that restrict or prevent the use of equipment in timber management. The chief factors affecting use of equipment on the soils are slope, susceptibility to erosion, stoniness, and the presence of rock outcrop.

A rating of *slight* indicates no special problem in use of equipment. *Moderate* indicates that not all types of equipment can be used and that the hazard of erosion must be considered in locating and constructing haul roads, skid trails, and landings. *Severe* indicates that the type of equipment that can be used is limited and that special logging methods may have to be used. It also indicates that use of equipment can cause serious damage to the structure and stability of the soil.

For a short period after frost leaves the ground in spring and occasionally during the summer rainy season, all of the timbered soils are too soft and wet to support equipment.

Erosion hazard is determined by inherent soil characteristics, such as slope, surface cover of stones and cobblestones, and aspect. Ratings of *slight*, *moderate*, and *severe* are used to indicate susceptibility to erosion if the soil is disturbed or if it lacks a protective cover of vegetation.

A rating of *slight* indicates that only a small loss of soil occurs where there has been disturbance or loss of protective vegetation. *Moderate* indicates that disturbance of the surface layer and loss of protective vegetation will result in conditions conducive to erosion. Careful planning and construction of roads, skid trails, and landings are necessary to prevent soil loss. *Severe* indicates that the soils are subject to serious erosion where there has been disturbance or loss of protective vegetation. Harvesting must be done carefully, and logging methods that minimize soil disturbance and loss of protective vegetation are advisable. All roads and skid trails must be carefully located and constructed and must be adequately drained to control excessive runoff.

suitability groups

production are assigned to timber suitability groups]

Suitability for—			Plant competition	Equipment limitations	Erosion hazard
Ponderosa pine	Douglas-fir and white fir	Engelmann spruce and corkbark fir			
High	High		Severe	Slight	Slight to moderate.
Moderately high	Moderately high		Severe	Moderate	Slight to moderate.
		Moderately high	Slight	Moderate	Moderate.
Moderate	Moderate		Moderate to severe	Moderate to severe	Severe.
	Low		Moderate	Severe	Moderate to severe.

Engineering[9]

This section is useful to those who need information about soils used as structural material or as foundations for structures. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

The soil properties most important in engineering are permeability, shear strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and soil reaction. Also important are depth to the water table, depth to bedrock, and slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section can be used to—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of soils on which they are built to predict performance of structures on the same or similar soils in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 7, 8, and 9, which show, respectively, estimates of soil properties significant in engineering, interpretations for various engineering uses, and results of engineering laboratory tests on soil samples. This information along, with the general soil map and other sections of this publication, can be used to make interpretations in addition to those shown in tables 7 and 8 and also can be used to make other useful maps.

This information, however, does not eliminate the need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally to depths greater than 6 feet. Inspection of sites, especially small ones, is needed because many delineated areas of a given mapping unit contain small areas of other soils that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

[9] JAMES H. DUNLAP, civil engineer, Soil Conservation Service, helped prepare this section.

TABLE 7.—*Engineering classification*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soils. Because the to other series that appear in the first column of this table. The

Soil series and map symbols	Depth to—		Depth from surface	USDA texture of representative profile	Classification		Coarse fraction greater than 3 inches
	Bedrock	Seasonal high water table			Unified	AASHTO	
	Feet	*Feet*	*Inches*				*Percent*
Agua: Af, Ag	>5	[1] >5	0–10	Loam or silty clay loam.	CL–ML or CL	A–4 or A–6	
			10–24	Loam and very fine sandy loam.	CL–ML or SM	A–4	
			24–60	Fine sand	SP or SP–SM	A–3	
Agua variant: Ah	>5	[1] 1–3	0–13	Loam	CL–ML or CL	A–4 or A–6	
			13–30	Loamy very fine sand.	SM or ML	A–4	
			30–60	Sand	SP or SP–SM	A–3	
*Akela: AkC No valid estimates for Rock outcrop part.	0. 5–1. 5	>5	0–15	Cobbly sandy loam and gravelly sandy loam.	GM or SM	A–1 or A–2	15–50
			15	Bedrock.			
Alemeda: AmB	1. 5–3. 5	>5	0–9	Sandy loam and loam.	SM, SC, or SC–SM	A–2 or A–4	
			9–26	Gravelly, cobbly, and very cobbly sandy loam.	SM, SC, or SC–SM	A–2 or A–4	15–55
			26	Bedrock.			
Anapra: An, Ao	>5	[1] >5	0–8	Silt loam or silty clay loam.	CL–ML or CL	A–4 or A–6	
			8–24	Clay loam	CL–ML or CL	A–6	
			24–60	Sand	SP or SP–SM	A–3	
Armijo: Ar	>5	>5	0–8	Clay loam	CL–ML or CL	A–6	
			8–46	Clay	CL, MH, or CH	A–7	
			46–67	Loamy sand	SP–SM or SM	A–3 or A–2	
Badland: Ba No valid estimates; material too variable.	>5	>5					
*Bluepoint: Bb, BcA, BCC, Bd3, BKD For Wink part of Bd3, see Wink series; for Kokan part of BKD, see Kokan series.	>5	>5	0–60	Loamy fine sand and loamy sand.	SP–SM or SM	A–3 or A–2	
Bond Mapped only with Rock outcrop and Penistaja soils.	1–1. 5	>5	0–18	Sandy clay loam	SC–SM or SC	A–2, A–4, or A–6	0–15
			18	Bedrock.			
*Borolls: BOF No valid estimates; material too variable.	1–5	>5					

See footnotes at end of table.

and estimated properties

soils in such mapping units can have different properties and limitations, it is necessary to follow carefully the instructions for referring symbol>means more than; the symbol <means less than]

Percentage passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Risk of corrosion to—	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)								Uncoated steel	Concrete
						Inches per hour	*Inches per inch of soil*	*pH*	*Millimhos per centimeter at 25° C*			
--------	100	85–100	60–90	20–35	5–15	0. 6–2. 0	0. 16–0. 20	7. 9–8. 4	1–4	Moderate---	Moderate---	Low.
--------	100	70–95	45–70	15–25	0–5	0. 6–2. 0	0. 13–0. 17	7. 9–8. 4	1–4	Low-------	Moderate---	Low.
--------	100	50–90	0–10	[2] NP	NP	6. 0–20. 0	0. 05–0. 07	7. 9–8. 4	0–1	Low-------	Low-------	Low.
--------	100	85–100	60–90	20–35	5–15	0. 2–2. 0	0. 13–0. 15	8. 5–9. 0	4–8	Moderate---	High-------	Low.
--------	100	90–95	40–60	NP	NP	0. 6–2. 0	0. 08–0. 10	8. 5–9. 0	4–8	Low-------	High-------	Low.
--------	100	50–90	0–10	NP	NP	6. 0–20. 0	0. 05–0. 07	7. 9–8. 4	1–4	Low-------	High-------	Low.
40–70	25–60	20–45	15–30	NP	NP	0. 6–2. 0	0. 05–0. 10	7. 9–8. 4	0–1	Low-------	High-------	Low.
90–100	90–100	85–95	30–50	15–25	0–10	0. 6–2. 0	0. 14–0. 18	7. 9–8. 4	2–4	Low-------	Moderate---	Low.
65–85	60–80	50–75	20–45	20–30	5–10	0. 6–2. 0	0. 07–0. 11	7. 9–8. 4	2–4	Low-------	Moderate---	Low.
--------	100	90–100	75–90	20–35	5–15	0. 2–0. 6	0. 19–0. 21	7. 9–8. 4	1–4	Low to moderate.	Moderate---	Low.
--------	100	90–100	75–85	25–40	10–20	0. 2–0. 6	0. 19–0. 21	7. 9–8. 4	1–4	Moderate---	Moderate---	Low.
--------	100	50–90	0–10	NP	NP	6. 0–20. 0	0. 05–0. 07	7. 9–8. 4	0–1	Low-------	Low-------	Low.
--------	100	90–100	75–85	25–35	10–15	0. 2–0. 6	0. 17–0. 19	7. 9–8. 4	1–4	Moderate---	High-------	Low.
--------	100	90–100	85–100	40–60	20–30	<0. 06	0. 12–0. 14	7. 9–8. 4	1–4	High-------	High-------	Low.
--------	100	50–90	5–20	NP	NP	6. 0–20. 0	0. 05–0. 07	7. 9–8. 4	1–4	Low-------	Low-------	Low.
90–100	85–100	70–95	5–20	NP	NP	6. 0–20. 0	0. 07–0. 09	7. 4–8. 4	0–1	Low-------	Low-------	Low.
85–100	80–100	65–90	25–50	20–35	5–15	0. 2–0. 6	0. 12–0. 14	7. 9–8. 4	0–1	Moderate---	Moderate---	Low.

TABLE 7.—*Engineering classification*

Soil series and map symbols	Depth to—		Depth from surface	USDA texture of representative profile	Classification		Coarse fraction greater than 3 inches
	Bedrock	Seasonal high water table			Unified	AASHTO	
	Feet	*Feet*	*Inches*				*Percent*
Brazito: Br, Bs, Bt	>5	>5	0–9	Fine sandy loam to silty clay loam.	SM, CL–ML, or CL	A–4 or A–6	
			9–60	Sand	SP or SP–SM	A–3	
Burnac: BUE	>5	>5	0–6	Gravelly loam and very gravelly loam.	GM	A–2 or A–4	5–20
			6–14	Gravelly sandy clay loam.	SC–SM or SC	A–2, A–4, or A–6	5–15
			14–60	Clay	CH	A–7	
Carlito: CAF	>5	>5	0–4	Stony loam	CL–ML or CL	A–4	15–45
			4–60	Clay and silty clay.	CL or CH	A–7	
Cut and fill land: Cu No valid estimates; material too variable.	>5	>5					
*Embudo: EmB, EtC For Tijeras part of EtC, see Tijeras series.	>5	>5	0–20	Gravelly fine sandy loam and gravelly sandy loam.	SM	A–2, A–4	
			20–60	Gravelly loamy coarse sand.	SM	A–1	
Escabosa Mapped only with Laporte soils and Rock outcrop.	1. 5–3. 5	>5	0–15	Loam	CL–ML or ML	A–4	
			15–23	Gravelly loam	GM or CL–ML	A–4	0–10
			23	Bedrock.			
*Gila:							
GA, Gb, Ge, GH For Hantz part of GH, see Hantz series.	>5	[1]>5	0–44	Stratified loam to sandy loam.	SM or ML	A–4	
			44–60	Sand	SP or SP–SM	A–3	
Gc, Gd, GF	>5	[1]3–>5	0–60	Stratified loam to sandy loam.	SM or ML	A–4	
Glendale: Gk, Gm, Gs	>5	[1]>5	0–6	Clay loam or loam.	CL–ML or CL	A–4 or A–6	
			6–38	Silt loam	CL	A–6	
			38–60	Clay loam	CL	A–6	
Hantz: Ha	>5	[4]>5	0–65	Silty clay	CL or MH	A–7	
Ildefonso: ILC	>5	>5	0–60	Gravelly and very gravelly sandy loam.	GM or SM	A–1 or A–2	0–15
*Kim: KaB, KbB, KD No valid estimates for Badland part of KD.	>5	>5	0–60	Loam and clay loam.	CL–ML or CL	A–4 or A–6	
*Kokan: KOE, KR No valid estimates for Rock outcrop part of KR.	>5	>5	0–60	Gravelly sand and very gravelly sand.	GP, GP–GM, or GM	A–1	0–30

See footnotes at end of table.

and estimated properties—Continued

Percentage passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Risk of corrosion to—	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)								Uncoated steel	Concrete
						Inches per hour	*Inches per inch of soil*	*pH*	*Millimhos per centimeter at 25° C*			
--------	100	70–100	40–95	15–35	0–15	0. 6–2. 0	0. 13–0. 21	7. 9–8. 4	1–4	Low to moderate.	Moderate---	Low.
--------	100	65–85	0–10	NP	NP	6. 0–20. 0	0. 05–0. 07	7. 9–8. 4	0–1	Low-------	Low-------	Low.
40–70	35–65	30–60	20–50	<30	NP–5	0. 6–2. 0	0. 09–0. 11	6. 6–7. 3	0–1	Low-------	Low-------	Low.
70–80	65–75	55–65	20–40	20–35	5–15	0. 6–2. 0	0. 12–0. 14	6. 1–6. 5	0–1	Low-------	Low-------	Low.
90–100	85–95	35–90	70–85	50–65	25–35	<0. 06	0. 14–0. 16	6. 1–7. 3	0–1	High-------	High-------	Low.
95–100	90–100	75–100	60–90	20–30	5–10	0. 2–0. 6	0. 14–0. 18	7. 4–7. 8	0–1	High-------	High-------	Low.
--------	100	90–100	75–95	40–55	20–30	0. 06–0. 2	0. 15–0. 18	7. 8–8. 4	0–1	High-------	High-------	Low.
85–95	70–85	40–75	25–50	NP	NP	0. 6–0. 2	0. 07–0. 09	7. 9–8. 4	0–1	Low-------	Low-------	Low.
80–95	50–70	20–45	10–25	NP	NP	>20	0. 04–0. 06	7. 9–8. 4	0–1	Low-------	Low-------	Low.
--------	100	85–95	60–70	20–35	5–10	0. 6–2. 0	0. 16–0. 18	7. 9–8. 4	0–1	Low-------	High-------	Low.
65–95	60–90	50–85	40–65	20–30	0–5	0. 6–2. 0	0. 13–0. 15	7. 9–8. 4	0–1	Low-------	High-------	Low.
--------	100	95–100	40–60	NP	NP	0. 6–2. 0	0. 13–0. 18	7. 9–8. 4	0–1	Low-------	Moderate---	Low.
--------	100	50–90	0–10	NP	NP	6. 0–2. 0	0. 05–0. 07	7. 9–8. 4	0–1	Low-------	Low-------	Low.
--------	100	95–100	40–75	NP	NP	0. 6–2. 0	0. 07–0. 12	7. 9–9. 0	4–8	Low-------	High-------	Low.
--------	100	90–100	60–80	25–35	5–15	0. 2–0. 6	[3]0.16–0. 20	7. 4–7. 8	[3] 1–4	Moderate---	High-------	Low.
--------	100	90–100	75–90	30–40	10–15	0. 2–0. 6	[3]0.19–0. 21	7. 9–8. 4	[3] 1–4	Moderate---	High-------	Low.
--------	100	90–100	70–80	30–40	10–15	0. 2–0. 6	[3]0.19–0. 21	7. 4–8. 4	[3] 1–4	Moderate---	High-------	Low.
--------	100	95–100	90–95	40–65	20–30	<0. 06	0. 10–0. 12	8. 5–9. 0	4–8	High-------	High-------	Low.
40–75	35–60	20–40	10–30	20–25	0–4	2. 0–6. 0	0. 06–0. 08	7. 9–9. 0	2–4	Low-------	High-------	Low.
--------	100	85–100	60–80	25–35	5–15	0. 6–2. 0	0. 16–0. 20	7. 4–8. 4	0–1	Moderate---	Moderate---	Low.
45–60	40–55	20–45	0–20	NP	NP	>20. 0	0. 03–0. 05	7. 4–7. 8	0–1	Low-------	High-------	Low.

TABLE 7.—*Engineering classification*

Soil series and map symbols	Depth to—		Depth from surface	USDA texture of representative profile	Classification		Coarse fraction greater than 3 inches
	Bedrock	Seasonal high water table			Unified	AASHTO	
	Feet	*Feet*	*Inches*				*Percent*
*Kolob: KS, KT, KU	3. 5–5	>5	0–13	Stony clay loam	CL	A–6	10–40
			13–42	Stony clay and very stony clay.	CL, CH, or MH	A–7	20–75
No valid estimates for Rock outcrop part of KT. For Sandia part of KU, see Sandia series.			42	Bedrock.			
Kolob variant: KVE	3. 5–5	>5	0–10	Stony and cobbly loam.	ML	A–4	15–25
			10–40	Very stony clay	CH or CL	A–7	50–80
			40	Bedrock.			
La Fonda: La	>5	>5	0–60	Loam and clay loam.	CL	A–6	
*Laporte: LBE, LRD	0. 5–1. 5	>5	0–15	Loam and gravelly loam.	GM, ML, or CL–ML	A–4	5–20
No valid estimates for Rock outcrop part of LBE and LRD. For Escabosa part of LRD, see Escabosa series.			15	Bedrock.			
Latene: LtB	>5	>5	0–15	Sandy loam	SM or SC–SM	A–2 or A–4	
			15–60	Gravelly sandy loam.	SM	A–2 or A–4	
*Madurez:							
MWA	>5	>5	0–21	Fine sandy loam and sandy clay loam.	SC–SM, SC, or CL	A–4 or A–6	
			21–60	Sandy loam	SM	A–2 or A–4	
MaB, MbC, MWB	>5	>5	0–9	Loamy fine sand	SM	A–2	
			9–21	Sandy clay loam	CL–ML or CL	A–4 or A–6	
For Bluepoint part of MbC, see Bluepoint series; for Wink part of MWB, see Wink series.			21–60	Sandy loam	SM	A–2 or A–4	
Manzano: Mz	>5	>5	0–25	Loam and clay loam.	CL–ML or CL	A–4	
			25–60	Silt loam	CL–ML or CL	A–4 or A–6	
Millett	>5	>5	0–10	Stony sandy loam and gravelly sandy clay loam.	SM or SM–SC	A–2 or A–4	10–20
Mapped only with Tesajo soils.			10–23	Very gravelly sandy loam.	SM–SC	A–2	5–15
			23–60	Very gravelly sand.	GP, GP–GM, GM, or SM	A–1	5–15
*Nickel: NL	>5	>5	0–11	Gravelly loam and gravelly fine sandy loam.	SM or ML	A–2 or A–4	0–5
For Latene part, see Latene series.			11–60	Very gravelly loam and very gravelly sandy loam.	GM	A–1	0–10
Orthids	1–3	>5					
No valid estimates; material too variable. Mapped only with Rock outcrop.							

See footnotes at end of table.

and estimated properties—Continued

Percentage passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Risk of corrosion to—	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)								Uncoated steel	Concrete
						Inches per hour	*Inches per inch of soil*	*pH*	*Millimhos per centimeter at 25° C*			
80–90	75–85	70–80	60–75	30–40	10–20	0. 2–0. 6	0. 12–0. 14	6. 1–7. 3	0–1	Moderate	Moderate	Low.
85–95	80–90	75–85	65–80	40–60	20–30	0. 2–0. 6	0. 11–0. 13	6. 6–7. 3	0–1	Moderate	High	Low.
90–100	85–100	75–95	50–75	20–30	0–5	0. 6–2. 0	0. 14–0. 16	6. 6–7. 8	0–1	Low	Low	Low.
85–100	80–100	70–100	55–95	40–55	20–30	0. 06–0. 2	0. 05–0. 07	7. 4–7. 8	0–1	Moderate	High	Low.
95–100	90–100	80–100	60–80	25–35	10–15	0. 6–2. 0	0. 15–0. 20	7. 9–8. 4	0–1	Moderate	High	Low.
70–90	65–85	55–80	40–60	15–25	0–5	0. 6–2. 0	0. 11–0. 15	7. 9–9. 0	0–1	Low	High	Low.
75–100	70–100	65–95	25–50	15–25	0–5	0. 6–2. 0	0. 12–0. 14	7. 9–8. 4	0–1	Low	High	Low.
55–80	50–75	40–55	20–40	20–35	0–10	0. 6–2. 0	0. 09–0. 11	7. 9–8. 4	0–1	Low	High	Low.
--------	100	90–100	45–60	25–35	5–15	0. 6–2. 0	0. 14–0. 16	7. 9–8. 4	0–1	Moderate	High	Low.
--------	100	85–95	30–50	15–30	0–5	0. 6–2. 0	0. 12–0. 14	7. 9–8. 4	0–1	Low	High	Low.
--------	100	85–95	15–30	NP	NP	2. 0–6. 0	0. 09–0. 11	7. 9–8. 4	0–1	Low	High	Low.
--------	100	95–100	50–65	25–35	5–15	0. 6–2. 0	0. 14–0. 16	7. 9–8. 4	0–1	Moderate	High	Low.
--------	100	85–95	30–50	15–30	0–5	0. 6–2. 0	0. 12–0. 14	7. 4–7. 8	0–1	Low	High	Low.
--------	100	85–100	60–80	20–30	5–10	0. 6–2. 0	0. 16–0. 18	7. 4–7. 8	0–1	Moderate	Moderate	Low.
--------	100	90–100	75–90	25–40	5–15	0. 2–0. 6	0. 16–0. 20	7. 4–7. 8	0–1	Moderate	Moderate	Low.
85–100	75–100	40–70	30–50	20–35	0–10	0. 6–2. 0	0. 08–0. 13	6. 6–7. 8	0–1	Moderate	Moderate	Low.
75–85	45–65	25–40	15–25	20–30	0–10	0. 6–2. 0	0. 06–0. 08	7. 4–7. 8	0–1	Low	Moderate	Low.
45–60	40–55	20–45	0–20	NP	NP	6.0–20.0	0. 03–0. 05	6. 6–7. 3	0–1	Low	Moderate	Low.
75–85	70–80	50–75	30–60	20–30	0–5	0. 6–2. 0	0. 08–0. 11	7. 9–8. 4	0–1	Low	High	Low.
40–60	35–50	20–35	15–25	20–30	0–5	0. 2–0. 6	0. 04–0. 06	7. 9–8. 4	1–4	Low	High	Low.

TABLE 7.—*Engineering classification*

Soil series and map symbols	Depth to—		Depth from surface	USDA texture of representative profile	Classification		Coarse fraction greater than 3 inches
	Bedrock	Seasonal high water table			Unified	AASHTO	
	Feet	*Feet*	*Inches*				*Percent*
Otero: OT	>5	>5	0–26	Fine sandy loam	SM	A–4	
			26–60	Loamy fine sand	SM	A–2	
Pajarito: PAC, PbB	>5	>5	0–60	Fine sandy loam and sandy loam.	SM or ML	A–2 or A–4	
*Penistaja: PEB, PFB, PG	>5	>5	0–5	Fine sandy loam	SM	A–4	
For Bond part of PG, see Bond series.			5–41	Sandy clay loam	CL–ML or CL	A–4 or A–6	
			41–60	Loamy fine sand	SM	A–2	
*Pino: PR	1.5–3.5	>5	0–8	Silty clay loam	CL–ML or CL	A–6	
No valid estimates for Rock outcrop part.			8–32	Silty clay	CL or CH	A–7	0–5
			32	Bedrock.			
*Rock outcrop: Ra, RBE, RCE, RLF, ROF, RUF. No valid estimates; material too variable. For Akela part of RBE, see Akela series; for Bond part of RCE, see Bond series; for Laporte part of RLF, see Laporte series; for Orthids part of ROF, see Orthids; for Ustolls part of RUF, see Ustolls.		>5					
Salas: SAF	2.0–3.5	>5	0–8	Very gravelly loam.	GM or GC	A–1 or A–2	5–15
			8–16	Very gravelly clay loam.	GC	A–2	5–15
			16–34	Very gravelly fine sandy loam.	GM or GC–GM	A–1	10–20
			34	Bedrock.			
*Sandia: SBE	3.5–5	>5	0–10	Stony loam	SM or ML	A–4	40–55
For Kolob part, see Kolob series.			10–41	Very stony sandy clay loam.	GM–GC, GC, SC, or SM	A–2	70–90
			41	Bedrock.			
*Scholle: SC	>5	>5	0–60	Gravelly loam	GM–GC, GC, CL–ML, or CL	A–4 or A–6	
For Ildefonso part, see Ildefonso series.							
*Seis: SEC, SFE, SGE, SHF	2.0–3.0	>5	0–7	Very cobbly loam	GM	A–1 or A–2	50–60
For Silver part of SGE, see Silver series.			7–30	Very stony clay loam.	CL–ML or ML	A–4	60–80
			30	Bedrock.			
*Shingle: SkE, SL	0.5–1.5	>5	0–15	Clay loam and silty clay loam.	CL	A–6	
No valid estimates for Badland part of SkE. For Kim part of SL, see Kim series.			15	Bedrock.			
*Silver: SmA, SnA, SwB, SwC	>5	>5	0–31	Silty clay loam	CL	A–6 or A–7	
For Witt part of SwB and SwC, see Witt series.			31–60	Silt loam	CL	A–6	

See footnotes at end of table.

and estimated properties—Continued

Percentage passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Risk of corrosion to—	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)								Uncoated steel	Concrete
						Inches per hour	*Inches per inch of soil*	*pH*	*Millimhos per centimeter at 25° C*			
--------	100	90–100	35–50	NP	NP	2. 0–6. 0	0. 13–0. 15	7. 4–8. 4	0–1	Low-------	Moderate---	Low.
--------	100	90–100	15–30	NP	NP	6.0–20.0	0. 09–0. 11	7. 4–8. 4	0–1	Low-------	Moderate---	Low.
--------	100	60–100	30–60	15–25	0–5	2. 0–6. 0	0. 13–0. 15	7. 9–8. 4	0–1	Low-------	High-------	Low.
--------	100	90–100	35–50	NP	NP	2. 0–6. 0	0. 13–0. 15	7. 4–7. 8	0–1	Low-------	Moderate---	Low.
--------	100	95–100	50–65	25–35	5–15	0. 6–2. 0	0. 14–0. 16	7. 4–8. 4	0–1	Moderate---	Moderate---	Low.
--------	100	95–100	15–30	NP	NP	2. 0–6. 0	0. 12–0. 14	7. 9–8. 4	0–1	Low-------	High-------	Low.
100	90–100	85–100	80–90	25–35	10–15	0. 2–0. 6	0. 19–0. 21	7. 4–7. 8	0–1	Moderate---	Moderate---	Low.
100	90–100	85–100	75–85	40–55	20–30	0.06–0.2	0. 14–0. 16	7. 4–8. 4	0–1	High-------	High-------	Low.
35–45	30–40	25–35	20–30	20–25	0–10	0. 6–2. 0	0. 10–0. 12	7. 4–7. 8	0–1	Low-------	Moderate---	Low.
35–45	30–40	25–40	15–30	25–35	10–15	0. 6–2. 0	0. 10–0. 12	7. 4–7. 8	0–1	Low-------	Moderate---	Low.
40–50	35–45	20–40	10–25	20–30	0–5	0. 6–2. 0	0. 06–0. 08	7. 9–9. 0	0–1	Low -------	High ------	Low.
75–85	70–80	60–75	40–60	NP	NP	0. 6–2. 0	0. 10–0. 12	6. 6–7. 3	0–1	Low-------	Low-------	Low.
50–75	45–70	35–65	25–35	25–35	5–15	0. 6–2. 0	0. 06–0. 08	6. 6–7. 3	0–1	Low-------	Moderate---	Low.
60–80	55–75	50–75	40–60	20–35	5–15	0. 6–2. 0	0. 13–0. 15	6. 6–8. 4	1–4	Low-------	Moderate---	Low.
35–55	30–50	20–45	15–35	20–30	0–5	0. 6–2. 0	0. 08–0. 10	7. 9–8. 4	0–1	Low-------	High-------	Low.
80–95	75–90	65–90	50–70	25–35	5–10	0. 6–2. 0	0. 08–0. 10	7. 9–8. 4	0–1	Low-------	High-------	Low.
85–100	80–100	75–100	60–90	30–40	10–20	0. 6–2. 0	0. 17–0. 20	7. 9–8. 4	1–4	Moderate---	High ------	Low.
80–100	75–100	70–100	65–95	35–45	15–25	0. 06–0. 2	0. 19–0. 21	[5] 7. 4–8. 4	[5] 0–1	Moderate---	High-------	Low.
80–100	75–100	70–100	55–90	30–40	10–20	0. 2–0. 6	0. 19–0. 21	[5] 7. 9–8. 4	[5] 0–1	Low-------	High-------	Low.

TABLE 7.—*Engineering classification*

Soil series and map symbols	Depth to—		Depth from surface	USDA texture of representative profile	Classification		Coarse fraction greater than 3 inches
	Bedrock	Seasonal high water table			Unified	AASHTO	
	Feet	*Feet*	*Inches*				*Percent*
*Tesajo: Te For Millett part, see Millett series.	>5	>5	0–60	Very gravelly loam to very gravelly loamy sand.	GP–GM, GM, or SM	A–1	0–10
Tijeras: TgB	>5	>5	0–19	Gravelly fine sandy loam and sandy clay loam.	SM, CL–ML, or CL	A–4	
			19–60	Gravelly sandy loam and very gravelly loamy sand.	SM	A–1 or A–2	0–10
Tome: To	>5	>5	0–11	Silt loam	ML or CL–ML	A–4	
			11–27	Clay loam	CL–ML or CL	A–4 or A–6	
			27–60	Fine sandy clay loam.	CL–ML or CL	A–4 or A–6	
Torrifluvents: TP No valid estimates; material too variable.	>5	[6] 1–5					
*Travessilla: TQC, TR No valid estimates for Rock outcrop part of TR.	0. 5–1. 5	>5	0–10 10	Sandy loam Bedrock.	SM	A–2 or A–4	0–25
Ustolls No valid estimates; material too variable. Mapped only with Rock outcrop.	1–5	>5					
*Vinton: Va, VbA, VBB, Vc, VF For Brazito part of VF, see Brazito series.	>5	[1] >5	0–10 10–60	Sandy loam Loamy sand	SM SM	A–2 or A–4 A–2	
*Wink: Wab, WeB, WM For Embudo part of WeB, see Embudo series; for Madurez part of WM, see Madurez series.	>5	>5	0–35 35–60	Sandy loam Sandy loam	SM SM or SM–SC	A–2 or A–4 A–2, A–4, or A–6	
Witt Mapped only with Silver soils.	>5	>5	0–60	Silty clay loam	CL or CL–ML	A–6	

[1] Protected from flooding by levees along the Rio Grande.
[2] Nonplastic.
[3] For unit Gs, available water capacity is lower and salinity is 4–8.

and estimated properties—Continued

Percentage passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Risk of corrosion to—	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)								Uncoated steel	Concrete
						Inches per hour	*Inches per inch of soil*	*pH*	*Millimhos per centimeter at 25° C*			
55–80	30–55	20–40	10–25	NP	NP	6. 0–20. 0	0. 05–0. 07	6. 6–7. 8	0–1	Low	Low	Low.
80–100	60–90	50–80	35–65	20–30	0–10	0. 6–2. 0	0. 10–0. 16	7. 9–8. 4	0–1	Low to moderate.	High	Low.
70–90	45–70	25–60	15–35	NP	NP	2. 0–20. 0	0. 03–0. 09	7. 9–8. 4	0–1	Low	High	Low.
	100	90–100	50–65	20–30	0–5	0. 2–0. 6	0. 18–0. 20	8. 5–9. 0	0–1	Low	High	Low.
	100	90–100	85–95	25–35	5–15	0. 2–0. 6	0. 18–0. 20	7. 9–8. 4	0–1	Moderate	High	Low.
	100	85–100	75–85	20–30	5–15	0. 6–2. 0	0. 14–0. 16	7. 9–8. 4	0–1	Moderate	High	Low.
75–100	65–95	40–80	20–50	NP	NP	2. 0–6. 0	0. 08–0. 13	7. 9–8. 4	0–1	Low	Low	Low.
	100	60–70	30–40	NP	NP	2. 0–6. 0	0. 10–0. 12	7. 9–8. 4	1–4	Low	High	Low.
	100	60–80	15–35	NP	NP	2. 0–6. 0	0. 06–0. 08	7. 9–8. 4	1–4	Low	High	Low.
	100	80–95	30–40	NP	NP	2. 0–6. 0	0. 09–0. 13	7. 9–8. 4	1–4	Low	High	Low.
	100	80–90	30–50	30–40	5–15	2. 0–6. 0	0. 09–0. 13	7. 9–8. 4	1–4	Low	High	Low.
	100	95–100	75–90	30–40	10–15	0. 2–0. 6	0. 18–0. 20	7. 4–8. 4	0–1	Moderate	High	Low.

[4] Subject to rare flooding.
[5] For unit SnA, reaction is 8.5–9.0 and salinity is 1–4.
[6] Subject to frequent flooding.

TABLE 8.—*Engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. Because the to other series that appear in the first column of this

Soil series and map symbols	Degree and kind of limitations for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill (trench type) [1]	Local roads and streets
Agua:						
Af	Slight	Severe: seepage.	Severe: cutbanks cave.	Slight	Severe: seepage.	Slight
Ag	Slight	Severe: seepage.	Severe: cutbanks cave.	Moderate: shrink swell.	Severe: seepage.	Moderate: shrink swell.
Agua variant: Ah	Severe: wet	Severe: wet	Severe: cutbanks cave.	Severe: wet	Severe: wet	Moderate: wet.
*Akela: AkC For Rock outcrop part, see Rock outcrop.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Alemeda: AmB	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.
Anapra: An, Ao	Slight	Severe: seepage.	Severe: cutbanks cave.	Moderate: shrink swell.	Severe: too sandy; seepage.	Moderate: shrink swell.
Armijo: Ar	Severe: percs slowly.	Slight	Severe: too clayey.	Severe: shrink swell; low strength.	Severe: too clayey.	Severe: shrink swell; low strength.
Badland: Ba	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
*Bluepoint: Bb, BcA, BCC, Bd3, BKD. For Wink part of Bd3, see Wink series; for Kokan part of BKD, see Kokan series.	Slight if slope is 1 to 8 percent, moderate if 8 to 15.	Severe: seepage.	Severe: cutbanks cave.	Slight if slope is 1 to 8 percent, moderate if 8 to 15.	Moderate: too sandy.	Slight if slope is 1 to 8 percent, moderate if 8 to 15.
*Bond Mapped only with Rock outcrop and Penistaja soils.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope; depth to rock.
*Borolls: BOF For Rock outcrop part, see Rock outcrop.	Severe: slope; depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Brazito: Br, Bs, Bt	Slight	Severe: seepage.	Severe: cutbanks cave.	Slight	Severe: seepage; too sandy.	Slight
Burnac: BUE	Severe: slope; percs slowly.	Severe: slope.	Severe: slope.	Severe: slope; high shrink swell.	Severe: slope; too clayey.	Severe: slope; too clayey.

See footnotes at end of table.

interpretations

soils in such mapping units can have different properties and limitations, it is necessary to follow carefully the instructions for referring table. Some terms in this table are defined in the glossary]

Suitability as source of—				Soil features affecting—		Hydrologic soil group
Road fill	Sand	Gravel	Topsoil	Pond reservoir areas	Dikes, levees, and other embankments	
Fair: low strength.	Good	Unsuited	Good	Seepage	Piping; low strength; unstable fill.	B
Fair: low strength.	Good	Unsuited	Fair: too clayey.	Seepage	Piping; low strength; unstable fill.	B
Fair: low strength.	Good	Unsuited	Fair: excess salt.	Seepage	Piping; low strength; unstable fill.	B
Poor: thin layer.	Unsuited	Unsuited	Poor: thin layer; area reclaim; small stones.	Depth to rock	Thin layer	C
Poor: area reclaim; thin layer.	Unsuited	Unsuited	Fair: thin layer; area reclaim.	Depth to rock	Piping; low strength.	C
Fair: shrink swell.	Good	Unsuited	Fair: too clayey.	Seepage	Piping	B
Poor: shrink swell; low strength.	Unsuited	Unsuited	Poor: too clayey.	Seepage	Compressible; low strength; hard to pack.	D
Poor: slope	Unsuited	Unsuited	Poor: slope	Slope	Hard to pack; thin layer.	C
Good	Fair: excess fines.	Unsuited	Poor: too sandy.	Seepage	Piping; seepage	A
Poor: thin layer.	Unsuited	Unsuited	Poor: thin layer.	Depth to rock	Thin layer	D
Poor: slope	Unsuited	Unsuited	Poor: slope	Slope	Thin layer	D
Good	Fair: excess fines.	Unsuited	Fair: thin layer.	Seepage	Seepage; piping; erodes easily.	A
Poor: shrink swell; slope.	Unsuited	Unsuited	Poor: stones; slope.	Slope	Low strength; shrink swell.	C

TABLE 8.—*Engineering*

Soil series and map symbols	Degree and kind of limitations for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill (trench type) [1]	Local road and streets
Carlito: CAF	Severe: slope; percs slowly.	Severe: slope.	Severe: slope; too clayey.	Severe: slope; shrink swell.	Severe: too clayey.	Severe: low strength; shrink swell.
Cut and fill land: Cu	Slight if slope is 1 to 8 percent, moderate if 8 to 15, severe if more than 15.	Severe: seepage.	Moderate: cutbanks cave; slope.	Slight if slope is 1 to 8 percent, moderate if 8 to 15, severe if more than 15.	Severe: seepage.	Slight if slope is 1 to 8 percent, moderate if 8 to 15, severe if more than 15.
*Embudo: EmB, EtC For Tijeras part of EtC, see Tijeras series.	Slight [2]	Severe: seepage.	Moderate: [2] small stones.	Slight [3]	Severe: seepage.	Slight
Escabosa Mapped only with Laporte soils and Rock outcrop.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.
*Gila: GA, Gb, Ge, GH For Hantz part of GH, see Hantz series.	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Slight	Moderate: low strength.
Gc, Gd, GF	Severe: wet	Moderate: seepage; wet.	Moderate: wet.	Slight	Severe: wet	Moderate: low strength.
Glendale:						
Gk, Gm	Severe: percs slowly.	Slight	Moderate: too clayey.	Moderate: shrink swell.	Moderate: too clayey.	Moderate: shrink swell.
Gs	Severe: percs slowly.	Moderate: wet	Moderate: too clayey.	Moderate: shrink swell.	Severe: wet; too clayey.	Moderate: shrink swell
Hantz: Ha	Severe: percs slowly; floods.	Slight	Severe: too clayey; rarely floods.	Severe: shrink swell; floods.	Severe: too clayey; floods.	Severe: shrink swell; floods.
Ildefonso: ILC	Slight if slope is less than 8 percent, moderate if 8 to 15, severe if more than 15.	Severe: seepage.	Severe if slope is more than 15 percent: small stones.	Slight if slope is less than 8 percent, moderate if 8 to 15, severe if more than 15.	Severe: seepage.	Slight if slope is less than 8 percent, moderate if 8 to 15, severe if more than 15.
*Kim: KaB, KbB, KD For Badland part of KD, see Badland.	Slight	Moderate: seepage.	Slight	Moderate: low strength; shrink swell.	Slight	Moderate: shrink swell.
*Kokan: KOE, KR For Rock outcrop part of KR see Rock outcrop.	Moderate if slope is 10 to 15 percent, severe if more than 15.	Severe: seepage; slope.	Severe: cutbanks cave; small stones.	Moderate if slope is 10 to 15 percent, severe if more than 15.	Severe: seepage; small stones.	Moderate if slope is 10 to 15 percent, severe if more than 15.

See footnotes at end of table.

interpretations—Continued

Suitability as source of—				Soil features affecting—		Hydrologic soil group
Road fill	Sand	Gravel	Topsoil	Pond reservoir areas	Dikes, levees, and other embankments	
Poor: low strength; shrink swell.	Unsuited	Unsuited	Poor: thin layer.	Slope	Hard to pack; low strength; compressible.	C
Good if slope is less than 15 percent, fair if more than 15.	Fair: excess fines.	Unsuited	Poor: small stones.	Seepage	Hard to pack; seepage.	A
Good	Poor: excess fines.	Poor: excess fines.	Poor: small stones.	Seepage	Piping; compressible	B
Poor: thin layer.	Unsuited	Poor: excess fines.	Poor: thin layer; small stones.	Depth to rock; seepage.	Piping; compressible	C
Fair: low strength.	Poor: excess fines.	Poor: excess fines.	Good	Seepage	Piping	B
Fair: low strength.	Poor: excess fines.	Poor: excess fines.	Poor: excess salts.	Seepage	Piping	B
Fair: shrink swell.	Unsuited	Unsuited	Fair: too clayey.	Favorable	Low strength; piping.	B
Fair: shrink swell.	Unsuited	Unsuited	Poor: excess fines.	Favorable	Low strength; piping.	B
Poor: shrink swell.	Unsuited	Unsuited	Poor: too clayey.	Favorable	Compressible; low strength.	D
Good if slope is less than 15 percent, fair if 15 to 25, poor if more than 25.	Poor: excess fines.	Poor: excess fines.	Poor: small stones.	Seepage	Favorable	B
Fair: low strength.	Unsuited	Unsuited	Good	Seepage	Piping; low strength	B
Good if slope is 10 to 15 percent, fair if 15 to 25, poor if more than 25.	Good	Good	Poor: small stones.	Seepage	Seepage	A

TABLE 8.—*Engineering*

Soil series and map symbols	Degree and kind of limitations for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill (trench type) [1]	Local road and streets
*Kolob: KS, KT, KU, KVE—For Rock outcrop part of KT, see Rock outcrop; for Sandia part of KU, see Sandia series.	Severe: depth to rock; percs slowly.	Severe: large stones; slope.	Severe: slope.	Severe: slope.	Severe: depth to rock; large stones.	Severe: slope.
La Fonda: La	Slight	Moderate: seepage.	Slight	Moderate: shrink swell.	Slight	Moderate: shrink swell.
*Laporte: LBE, LRD—For Rock outcrop part, see Rock outcrop; for Escabosa part of LRD, see Escabosa series.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Latene: LtB	Moderate: percs slowly.	Moderate: small stones.	Moderate: small stones.	Slight	Slight	Slight
*Madurez: MaB, MbC, MWA, MWB.—For Bluepoint part of MbC, see Bluepoint series; for Wink part of MWA and MWB, see Wink series.	Slight	Moderate: seepage.	Slight	Moderate: shrink swell.	Slight	Moderate: shrink swell.
Manzano: Mz	Moderate if protected: percs slowly. Severe: floods.	Moderate: seepage.	Slight if protected. Severe: floods.	Moderate if protected: shrink swell. Severe: floods.	Slight if protected. Severe: floods.	Moderate if protected: shrink swell; low strength. Severe: floods.
Millett—Mapped only with Tesajo soils.	Slight if slope is less than 8 percent, moderate if 8 to 15.	Severe: seepage.	Severe: small stones.	Moderate: shrink swell.	Severe: small stones; area reclaim.	Moderate: shrink swell.
*Nickel: NL—For Latene part, see Latene series.	Severe: percs slowly.	Severe: small stones.	Severe: small stones.	Slight if slope is 5 to 8 percent, moderate if 8 to 15, severe if more than 15.	Severe: small stones.	Slight if slope is 5 to 8 percent, moderate if 8 to 15, severe if more than 15.
Orthids—Mapped only with Rock outcrop.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slopes.	Severe: slope.
Otero: OT	Slight	Severe: seepage.	Severe: cutbanks cave.	Slight	Severe: seepage.	Slight
Pajarito: PAC, PbB	Slight	Severe: seepage.	Slight	Slight	Severe: seepage.	Slight
*Penistaja: PEB, PFB, PG—For Bond part of PG, see Bond series.	Slight	Moderate: seepage.	Slight	Moderate: shrink swell.	Slight	Moderate: low strength; shrink swell.

See footnotes at end of table.

interpretations—Continued

Suitability as source of—				Soil features affecting—		Hydrologic soil group
Road fill	Sand	Gravel	Topsoil	Pond reservoir areas	Dikes, levees, and other embankments	
Poor: slope	Unsuited	Unsuited	Poor: large stones.	Large stones; slope; depth to rock.	Hard to pack	C
Fair: low strength; shrink swell.	Unsuited	Unsuited	Good	Seepage	Low strength; compressible; piping.	B
Poor: thin layer	Unsuited	Unsuited	Poor: thin layer; small stones.	Depth to rock	Thin layer	C
Good	Poor: excess fines.	Poor: excess fines.	Poor: excess lime.	Seepage; small stones.	Piping; erodes easily.	B
Moderate: shrink swell.	Unsuited	Unsuited	Good for sandy loam. Poor for loamy fine sand: too sandy.	Slope if more than 3 percent.	Low strength; piping.	B
Fair: low strength; shrink swell.	Unsuited	Unsuited	Good	Slope if more than 2 percent.	Low strength; compressible; piping.	C
Fair: shrink swell.	Poor: excess fines.	Fair: excess fines.	Poor: small stones; area reclaim.	Seepage	Seepage; piping; hard to pack.	B
Good if slope is less than 15 percent; fair if more than 15.	Poor: excess fines.	Poor: excess fines.	Poor: small stones.	Small stones; slope	Piping	B
Poor: slope	Unsuited	Poor: slope	Poor: slope; thin layer; large stones.	Slope; depth to rock	Large stones; thin layer.	D
Good	Poor: excess fines.	Unsuited	Good	Seepage; slope	Piping	B
Good	Poor: excess fines.	Unsuited	Good	Seepage	Piping	B
Fair: shrink swell; low strength.	Unsuited	Unsuited	Fair: too clayey.	Slope; seepage	Low strength; piping.	B

TABLE 8.—*Engineering*

Soil series and map symbols	Degree and kind of limitations for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill (trench type) [1]	Local road and streets
Pino: PR——— For Rock outcrop part, see Rock outcrop.	Severe: percs slowly; depth to rock.	Severe: depth to rock.	Severe: too clayey.	Severe: shrink swell; low strength.	Severe: too clayey; depth to rock.	Severe: shrink swell.
*Rock outcrop: Ra, RBE, RCE, RLF, ROF, RUF. For Akela part of RBE, see Akela series; for Bond part of RCE, see Bond series; for Laporte part of RLF, see Laporte series; for Orthids part of ROF, see Orthids; for Ustolls part of RUF, see Ustolls.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Salas: SAF———	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock; large stones.	Severe: slope; large stones.	Severe: slope; depth to rock.	Severe: slope; large stones.
*Sandia: SBE——— For Kolob part, see Kolob series.	Severe: slope.	Severe: slope; large stones.	Severe: slope; large stones.	Severe: slope.	Severe: depth to rock.	Severe: slope.
*Scholle: SC——— For Ildefonso part, see Ildefonso series.	Slight if slope is 5 to 8 percent, moderate if more than 8.	Moderate if slope is 5 to 7 percent; seepage. Severe if slope is more than 7 percent.	Moderate: small stones.	Slight if slope is 5 to 8 percent, moderate if 8 or 12.	Slight———	Slight if slope is 5 to 8 percent, moderate if 8 to 12.
*Seis: SEC, SFE, SGE, SHF——— For Silver part of SGE, see Silver series.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate if slope is less than 15 percent; depth to rock. Severe if slope is more than 15 percent.	Severe: depth to rock.	Moderate if slope is less than 15 percent; depth to rock. Severe if slope is more than 15 percent.
*Shingle: SkE, SL——— For Badland part of SkE, see Badland; for Kim part of SL, see Kim series.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.

See footnotes at end of table.

interpretations—Continued

Suitability as source of—				Soil features affecting—		Hydrologic soil group
Road fill	Sand	Gravel	Topsoil	Pond reservoir areas	Dikes, levees, and other embankments	
Poor: shrink swell; low strength.	Unsuited	Unsuited	Poor: thin layer; area reclaim; too clayey.	Slope; depth to rock	Shrink swell; compressible; low strength.	C
Poor: large stones.	Unsuited	Unsuited	Poor: large stones; slope.	Depth to rock	Large stones; thin layer.	D
Poor: slope; large stones.	Unsuited	Unsuited	Poor: slope; large stones.	Slope; large stones	Large stones	C
Fair if slope is 15 to 25 percent; area reclaim; thin layer. Poor if slope is more than 25 percent.	Unsuited	Unsuited	Poor: slope; large stones.	Slope; depth to rock	Large stones	C
Fair: low strength.	Unsuited	Unsuited	Poor: small stones.	Seepage; slope	Compressible; low strength; piping.	B
Poor: area reclaim; thin layer; slope.	Unsuited	Unsuited	Poor: small stones; area reclaim.	Depth to rock; slope.	Thin layer; large stones.	C
Poor: thin layer	Unsuited	Unsuited	Poor: area reclaim.	Depth to rock	Low strength; thin layer; depth to rock.	D

TABLE 8.—*Engineering*

Soil series and map symbols	Degree and kind of limitations for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill (trench type) [1]	Local roads and streets
*Silver: SmA, SnA, SwB, SwC—For Witt part of SwB and SwC, see Witt series.	Severe: percs slowly.	Slight if slope is less than 2 percent, moderate if 2 to 7, severe if more than 7.	Moderate: too clayey.	Moderate: low strength; shrink swell.	Moderate: too clayey.	Severe: low strength.
*Tesajo: Te—For Millett part, see Millet series.	Slight if slope is less than 8 percent, [2] moderate if 8 to 15, severe if more than 15.	Severe: seepage.	Severe: small stones.	Slight if slope is less than 8 percent, [2] moderate if 8 to 15, severe if more than 15.	Severe: seepage.	Slight if slope is less than 8 percent, [2] moderate if 8 to 15, severe if more than 15.
Tijeras: TgB	Slight	Severe: seepage.	Severe: small stones; cutbanks cave.	Moderate: shrink swell.	Severe: seepage.	Moderate: shrink swell; low strength.
Tome: To	Severe: percs slowly.	Slight	Moderate: floods.	Moderate: shrink swell.	Moderate: floods.	Moderate: shrink swell.
Torrifluvents: TP	Severe: floods.	Severe: floods; seepage.	Severe: cutbanks cave; floods.	Severe: floods.	Severe: floods; seepage.	Severe: low strength.
*Travessilla: TQC, TR—For Rock outcrop part of TR, see Rock outcrop.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Ustolls—Mapped only with Rock outcrop.	Severe: slope; depth to rock.	Severe: slope.	Severe: slope.	Severe: slope; depth to rock.	Severe: depth to rock; slope.	Severe: slope; depth to rock.
*Vinton: Va, VbA, VBB, Vc, VF—For Brazito part of VF, see Brazito series.	Slight	Severe: seepage.	Severe: cutbanks cave.	Slight	Severe: seepage.	Slight
*Wink: WaB, WeB, WM—For Embudo part of WeB, see Embudo series; for Madurez part of WM, see Madurez series.	Slight	Severe: seepage.	Slight	Slight	Severe: seepage.	Slight
Witt—Mapped only with Silver soils.	Severe: percs slowly.	Slight if slope is 1 to 2 percent, moderate if 2 to 7.	Moderate: too clayey.	Moderate: shrink swell.	Moderate: too clayey.	Moderate: shrink swell; low strength.

[1] Onsite study of the underlying strata, the water table, and the hazards of aquifer pollution and drainage into ground water needs to be made for landfill deeper than 5 or 6 feet.

interpretations—Continued

Suitability as source of—				Soil features affecting—		Hydrologic soil group
Road fill	Sand	Gravel	Topsoil	Pond reservoir areas	Dikes, levees, and other embankments	
Poor: low strength.	Unsuited	Unsuited	Poor: too clayey.	Slope if more than 2 percent.	Low strength; compressible.	C
Good if slope is less than 15 percent, fair if more than 15.	Poor: excess fines.	Poor: excess fines.	Poor: small stones.	Seepage	Seepage; piping	A
Fair: shrink swell; low strength.	Poor: excess fines.	Poor: excess fines.	Poor: small stones.	Seepage	Low strength; piping.	B
Fair: shrink swell.	Unsuited	Unsuited	Fair: too clayey.	Favorable	Low strength; compressible; piping.	B
Poor: low strength.	Poor: excess fines.	Unsuited	Poor: excess alkali; excess salts; too sandy.	Seepage	Seepage; excess salts; excess alkali.	A
Poor: thin layer; slope.	Unsuited	Unsuited	Poor: area reclaim.	Depth to rock	Thin layer	D
Poor: area reclaim; large stones.	Unsuited	Unsuited	Poor: slope; large stones; thin layer.	Slope; depth to rock.	Large stones; thin layer.	D
Good	Poor: excess fines.	Unsuited	Poor: too sandy.	Seepage	Piping; seepage	B
Fair: low strength.	Unsuited	Unsuited	Good	Seepage	Piping; erodes easily.	B
Fair: low strength; shrink swell.	Unsuited	Unsuited	Fair: thin layer.	Favorable	Compressible; piping; low strength.	B

[2] Some local areas are subject to flooding.
[3] Soil is subject to consolidation under load.

TABLE 9.—*Highway*

[Tests performed by the New Mexico State Highway Department, Materials and Testing Division, in accordance with

Soil name and location	Parent material	New Mexico State Highway Department Report Number	Depth	Estimated percent by volume, of coarse fragments greater than 3 inches	Mechanical analysis	
					Percentage passing sieve—	
					3 inches	2 inches
			Inches			
Alemeda sandy loam, 0 to 5 percent slopes: Northwest corner of sec. 28, T. 11 N., R. 2 E. (Modal profile)	Wind-laid sediments and material weathered from basalt bedrock.	68–15376	0–4			
		68–15377	4–9			
		68–15378	9–13			
		68–15379	13–18	20	100	51
		68–15380	18–26	40		100
Bluepoint loamy fine sand, 1 to 9 percent slopes: Northwest corner of sec. 5, T. 11 N., R. 3 E. (Modal profile)	Sandy alluvium and wind-laid sediments.	68–15351	8–20			
		68–15352	20–40			
Bluepoint fine sand, hummocky: NW¼SE¼SE¼ sec. 8, T. 10 N., R. 1 E. (Coarser textured than modal profile)	Wind-laid sand.	68–15362	0–60			
Latene sandy loam, 1 to 5 percent slopes: NE¼SW¼NW¼ sec. 26, T. 11 N., R. 1 E. (Modal profile)	Old alluvium and mixed wind-laid sediments.	68–15358	0–7			
		68–15359	7–15			100
		68–15360	15–24			
		68–15361	24–41			
Millett stony sandy loam in an area of Tesajo-Millett stony sandy loams: SW¼SE¼ sec. 4, T. 10 N., R. 4 E. (Modal profile)	Decomposed granitic alluvium.	68–15369	0–4	20		
		68–15370	4–10	10		
		68–15371	10–23	10		
Pajarito loamy fine sand, 1 to 9 percent slopes: W½ sec. 17, T. 11 N., R. 1 E. (Modal profile)	Eolian and alluvial sediments on old alluvial mesas and upland piedmonts, mainly from the Santa Fe Geological Formation.	68–15355	0–3			
		68–15356	3–23			
		68–15357	23–42			
Tesajo stony sandy loam in an area of Tesajo-Millett stony sandy loams: SW¼NE¼ sec. 14, T. 11 N., R. 4 E. (Modal profile)	Alluvial sediments from granite rocks.	68–15368	9–27	10		
Tijeras gravelly fine sandy loam, 1 to 5 percent slopes: SE¼SE¼ sec. 4, T. 10 N., R. 4 E. (Modal profile)	Old alluvial sediments mainly from granitic rocks.	68–15363	0–4			
		68–15364	4–9			
		68–15365	9–14			
		68–15366	14–19			
		68–15367	19–40			

[1] NP means nonplastic.

Some of the terms used in this soil survey have special meanings in soil science that may not be familiar to engineers. The Glossary defines many of these terms.

Engineering soil classification systems

The two systems most commonly used in classifying soils for engineering are the Unified system (*7*) used by the Soil Conservation Service engineers, Department of Defense, and others and the AASHTO system adopted by the American Association of State Highway and Transportation Officials (*1*). These classification systems are explained in the PCA Soil Primer (*4*).

The Unified system classifies soils according to particle-size distribution, plasticity, liquid limit, and organic-matter content. In this system soils are grouped in 15 classes. Eight classes are coarse grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes are fine grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class is highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by the symbols for both classes, as in CL–ML.

test data

standard procedures of the American Association of State Highway and Transportation Officials (AASHTO)]

Mechanical analysis—Continued							Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued										
1 inch	¾ inch	⅜ inch	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)			AASHTO	Unified
				100	91	36	[1] NP	NP	A–4 (1)	SM
				100	94	45	21	5	A–4 (2)	CL–ML
				100	92	51	22	1	A–4 (3)	ML
47	45	43	42	41	36	19	27	7	A–2–4 (0)	GM
88	84	81	79	78	66	31	25	5	A–2–4 (0)	CL–ML
				100	92	17	NP	NP	A–2–4 (0)	SM
				100	90	18	NP	NP	A–2–4 (0)	SM
				100	97	2	NP	NP	A–3 (0)	SP
				100	95	40	NP	NP	A–4 (1)	SM
99	98	95	89	84	76	41	24	5	A–4 (1)	SM–SC
				100	76	35	NP	NP	A–2–4 (0)	SM
				100	70	29	36	8	A–2–4 (0)	SM
				100	47	37	NP	NP	A–4 (1)	SM
	100	99	93	76	57	37	31	7	A–4 (1)	SM–SC
	100	96	81	47	31	20	30	8	A–2–4 (1)	SM–SC
				100	99	24	NP	NP	A–2–4– (0)	SM
				100	98	42	NP	NP	A–4 (1)	SM
				100	93	69	24	5	A–4 (7)	CL–ML
	100	95	80	54	37	21	NP	NP	A–1–b (0)	SM
		99	93	75	60	45	NP	NP	A–4 (2)	SM
		99	95	86	77	56	24	5	A–4 (4)	CL–ML
		99	95	85	77	60	25	4	A–4 (5)	CL–ML
		98	93	78	62	44	24	4	A–4 (2)	CL–ML
		99	89	64	45	27	NP	NP	A–2–4 (0)	SM

The AASHTO system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a soil is placed in one of seven basic groups on the basis of grain-size distribution, liquid limit, and plasticity index. The groups range from A–1, or gravelly soils, which have high bearing strength and are the best soils for foundation or subgrade, to A–7, or clay soils, which have low strength if wet and are the poorest soils for subgrade. Where sufficient laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided into groups A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHTO classification for tested soils, with group index numbers in parentheses, is shown in table 9; the estimated classification for all soils mapped in the survey area, without group index numbers, is shown in table 7.

Soil properties significant in engineering

Estimates for soil properties significant in engineering are shown in table 7. These estimates are made for typical soil profiles, by layers sufficiently different to have different significance for soil engineering. They are based on field observations made in mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of some of the columns in table 7.

Depth to bedrock is the distance from the surface of the soil to the upper surface of the rock layer.

Depth to seasonal high water table is the distance from the surface of the soil to the highest level that ground water reaches in most years.

Soil texture is described in table 7 in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, such as "gravelly loamy sand." "Sand," "silt," "clay," and some of the other terms used in USDA textural classification are defined in the Glossary.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content in a dry clayey soil is increased, the material changes from a semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material changes from a semisolid to a plastic state; and the liquid limit, from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic. Liquid limit and plasticity index are estimated in table 7, but in table 9 the data on liquid limit and plasticity index are based on tests of soil samples.

Permeability is the ability of a soil to transmit water and air. It is estimated on the basis of soil characteristics observed in the field, particularly structure, porosity, and texture. The estimates in table 7 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available water capacity is the ability of soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. The pH value and terms used to describe reaction are explained in the Glossary.

Salinity refers to the amount of soluble salts in the soils. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25° C. Salinity affects the suitability of a soil for crop production, its stability when used as construction material, and its risk of corrosion to metals and concrete.

Shrink-swell potential is the change in volume to be expected of soil material with changes in moisture content, that is, the extent to which the soil shrinks when dry or swells when wet. The extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils cause much damage to building foundations, roads, and other structures. A *high* shrink-swell potential indicates a hazard to maintenance of structures built in, on, or with material having this rating.

Risk of corrosion is the potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion on uncoated steel is related to such soil properties as drainage, texture, total acidity, and electrical conductivity of the soil material. The rate of corrosion on concrete is influenced mainly by the content of sodium or magnesium sulfate, but also by soil texture and acidity. Installations that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations that are entirely in one kind of soil or in one soil horizon. A rating of *low* indicates a low probability of soil-induced corrosion damage. *High* indicates a high probability of damage, so that protective measures for steel and more resistant concrete should be used to avoid or minimize damage.

Engineering interpretations of soils

The interpretations in table 8 are based on the estimated engineering properties of soils shown in table 7, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of the survey area. Ratings in table 8 summarize the limitations of the soils for septic tank absorption fields, sewage lagoons, shallow excavations, dwellings without basements, sanitary landfill, and local roads and streets; summarize the suitability of the soils as sources of road fill, sand, gravel, and topsoil; and list those soil features to be considered in planning, installing, and maintaining pond reservoir areas and dikes, levees, and other embankments.

Soil limitations are indicated by the ratings *slight*, *moderate*, and *severe*. *Slight* indicates soil properties generally favorable for the rated use, or in other words, limitations that are minor and easily overcome. *Moderate* indicates that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Severe* indicates that soil properties are so unfavorable and so difficult to correct or overcome that major soil reclamation, special design, or intensive maintenance are required.

Soil suitability is indicated by the ratings *good*, *fair*, and *poor*, which have, respectively, meanings approximately parallel to the terms *slight*, *moderate*, and *severe*.

The columns in table 8 are explained in the following paragraphs.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material from a depth of 18 inches to 6 feet is evaluated. The soil properties considered are those that affect absorption of effluent and construction and operation of the system. Permeability, depth to water table or bedrock, and susceptibility to flooding affect absorption. Slope affects difficulty of layout and construction and also the risk of soil erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Sewage lagoons are shallow ponds constructed to hold sewage at a depth of 2 to 5 feet long enough for bacteria to decompose the solids. A lagoon has a nearly level floor and has sides, or embankments, of compacted soil material. It is assumed that the embankment is compacted to medium density and that the pond is protected from flooding. The soil properties considered are those that affect the pond floor and the embankment. Permeability, organic matter, and slope affect the pond floor. If the floor needs to be leveled, depth to bedrock becomes important. The soil properties that affect the embankment are the engineering properties of the embankment material as interpreted from the Unified Soil Classification and the number of stones, if any, that influence the ease of excavation and compaction of the embankment material.

Shallow excavations are those that require digging or trenching to a depth of less than 6 feet, such as excavations for pipelines, sewer lines, phone and power transmission lines, basements, open ditches, and cemeteries. Desirable soil properties are good workability, moderate resistance to sloughing, gentle slope, absence of rock outcrop or big stones, and freedom from flooding or a high water table.

Dwellings, as rated in table 8, are not more than three stories high and are supported by foundation footings in undisturbed soil. The soil properties considered are those that relate to capacity to support load and resist settlement under load and those that relate to ease of excavation. Wetness, frost action, susceptibility to flooding, density, plasticity, texture, and shrink-swell potential affect load-supporting capacity. Wetness, slope, depth to bedrock, and content of stones and rocks affect excavation.

Sanitary landfill is a method of disposing of refuse in dug trenches. The waste is spread in thin layers, compacted, and covered with soil throughout the disposal period. Landfill areas are subject to heavy vehicular traffic. Some soil properties that affect suitability for landfill are ease of excavation, hazard of polluting ground water, and trafficability. The best soils have moderately slow permeability, withstand heavy traffic, and are friable and easy to excavate. Unless otherwise stated, the ratings in table 8 apply only to a depth of about 6 feet, and therefore limitation ratings of *slight* or *moderate* may not be valid if trenches are to be deeper. Reliable predictions can be made to a depth of 10 or 15 feet for some soils, but every site should be investigated before it is selected.

Local roads and streets, as rated in table 8, have a subgrade of underlying soil material; a base consisting of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid all-weather surface, generally of asphalt or concrete, which is expected to carry automobile traffic all year. These roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil at hand, and most cuts and fills are less than 6 feet deep.

Soil properties that affect design and construction of roads and streets are the load-supporting capacity and stability of the subgrade and the workability and quantity of cut and fill material available. The AASHTO and Unified classifications of the soil material and the shrink-swell potential indicate traffic-supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and the amount of cut and fill needed to reach an even grade.

Road fill is soil material used in embankments for roads. The suitability ratings reflect the predicted performance of a soil after it has been placed in an embankment that has been properly compacted and provided with adequate drainage. They also indicate the ease of excavating the material at borrow areas.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 8 provide guidance about where to look for probable sources. A soil rated as a *good* or *fair* source of sand or gravel generally has a layer at least 3 feet thick, the top of which is within a depth of 6 feet. The ratings do not take into account thickness of overburden, location of the water table, or other factors that affect mining of the materials, nor do they indicate quality of the deposit.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material, for example, in preparing a seedbed; the natural fertility of the material, or the response of plants when fertilizer is applied; and the absence of substances toxic to plants. It is also affected by the texture of the soil material and the content of rock fragments. Also considered in the ratings is the damage that will result at the area from which topsoil is removed.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for this purpose have low seepage, which is related to permeability and depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage and piping and has favorable stability, shrink-swell potential, shear strength, and compactibility. The presence of stones or organic material in a soil is among factors that adversely affects suitability.

Hydrologic soil groups indicate the rate at which soils take in water during rainstorms. The rate is measured when soils are wet and where they are not protected by plants. The soils in this area are classified into four hydrologic soil groups. Soils in group A soak up the most rainfall and lose the least water in runoff. Those in group B absorb more water than is typical, and those in group C absorb less. Soils in group D soak up the least rainfall and lose the most water in runoff.

Test data

Table 9 contains engineering test data for soils in some of the major series in the survey area. These tests were made to help evaluate the soils for engineering purposes. The engineering classifications shown are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. The mechanical analyses were made by combined sieve and hydrometer methods.

Tests to determine liquid limit and plastic limit measure the effect of water on the consistence of soil material, as explained for table 7.

Recreation

Knowledge of soils is necessary in planning, developing, and maintaining areas used for recreation. In table 10 the

soils are rated according to limitations that affect their suitability for camp areas, picnic areas, playgrounds, and paths and trails.

Soil limitations for specified uses are indicated by the ratings *slight*, *moderate*, or *severe*. For all of these ratings, it is assumed that a good cover of vegetation can be established and maintained. A rating of *slight* indicates that soil properties are generally favorable and limitations are minor and can be easily overcome. *Moderate* indicates that limitations can be overcome or modified by planning, by design, or by special maintenance. *Severe* indicates that costly soil reclamation, special design, intense maintenance, or a combination of these is required.

Camp areas are subject to heavy foot traffic and limited vehicular traffic. Little preparation of the site is required, other than shaping and leveling for tent and parking areas. The best soils have a surface that is free of rocks and coarse fragments and is firm when wet but not dusty when dry. They are also free of flooding during periods of heavy use and have mild slopes and good drainage.

Picnic areas are subject to heavy foot traffic, but most of the vehicular traffic is confined to access roads. The best soils are firm when wet but not dusty when dry and are free of flooding during periods of use. Also, they do not have slopes or stoniness that greatly increases the cost of leveling sites or of building access roads.

Playgrounds are subject to intensive foot traffic. The best soils have a level surface that is free of coarse fragments and rock outcrop and are firm when wet but not dusty when dry. They are free of flooding during periods of heavy use and have good drainage. If grading and leveling are required, depth to bedrock must be considered.

Paths and trails are used for local and cross-country travel by foot or horseback. Design and layout should require little or no cutting and filling. The best soils are firm when wet but not dusty when dry, are flooded not more than once during periods of use, and are at least moderately well drained. They have slopes of less than 15 percent and have few or no rocks or stones on the surface.

Formation and Classification of the Soils

This section describes the morphological characteristics of the soils in the survey area and relates them to the factors of soil formation. It also defines the current system for classifying soils and classifies the soils in the survey area according to that system.

Factors of Soil Formation

Soil forms through the physical and chemical weathering of deposited or accumulated geologic material. Five factors of soil formation determine the characteristics of a soil.

The physical and mineralogical composition of the parent material affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Climate and plant and animal life act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body that has genetically related horizons. Relief, or the lay of the land, conditions the effects of climate and vegetation on the parent material. Finally, time is needed for the formation of distinct soil horizons.

These factors are so closely interrelated that few generalizations can be made regarding the effect of any one factor.

Parent material

The soils in this area formed mainly in recent alluvium, old unconsolidated alluvium, alluvium modified by wind, alluvial fan and piedmont sediments, or material weathered from basalt, granite, schist, limestone, sandstone, and shale. The influence of parent material is apparent in most soils in their texture, mineralogy, structure, reaction, and color.

Recent alluvium is deposited on the flood plain of the Rio Grande when the river overflows its channel and suddenly loses transporting power. The heavier sand is deposited first, then silt, and finally clay. The Rio Grande has changed its course many times, and the pattern of sediments, and therefore of soils, is complex. Brazito and Vinton soils formed in sandy alluvium, and Agua and Anapra soils formed in loamy and silty alluvium deposited over sandy alluvium. Armijo soils formed in clayey alluvium in oxbow lakes or areas of slack water. Although levees have protected the flood plain from major flooding since about 1927, the irrigated cropland continues to receive annual small quantities of sediment from silty irrigation water diverted from the Rio Grande.

Old unconsolidated alluvium, mostly from the ancestral Rio Grande and its tributaries, is the main parent material in the survey area. Madurez and Wink soils formed in sandy and loamy alluvium, and Kokan soils formed in sandy and gravelly alluvium.

Sandy alluvium is often reworked or moved by the wind. Bluepoint soils formed in reworked sandy alluvium deposited on the sides of the Rio Grande and Rio Puerco Valleys and on piedmonts and mesas.

Gravelly alluvial fans and piedmont sediments occur long the front of the Manzano and Sandia Mountains. Ildefonso soils formed in a mixture of these paren materials.

Several extinct volcanic mountains and basalt flows are in the north-central part of the area. Akela and Alemeda soils formed in residuum weathered from basalt mixed with wind-deposited sediments.

The Manzano and Sandia Mountains are made up of folded igneous, metamorphic, and sedimentary rocks. Salas soils formed in residuum weathered from schist mixed with some gneiss and quartzite. Laporte and Escabosa soils formed in material weathered from limestone.

Most of the soils contain several clay minerals, including montmorillonite, vermiculite, illite, kaolinite, and chlorite. Armijo soils, however, formed in clayey alluvium and have montmorillonitic mineralogy.

All of the soils have varying amounts of carbonates received as part of the dust deposited by the wind.

Climate

The survey area has an arid, continental climate. The average annual precipitation is mostly 7 to 10 inches, but the Manzano Mountains and the adjacent foothills receive 10 to 14 inches and Sandia Crest in the Sandia Mountains receives 25 to 30 inches. The average annual temperature

TABLE 10.—*Limitations for recreational facilities*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. Because the soils in such mapping units can have different properties and limitations, it is necessary to follow carefully the instructions for referring to other series that appear in the first column of this table. Some terms in this table are defined in the glossary]

Soil series and map symbols	Camp areas	Picnic areas	Playgrounds	Paths and trails
Agua: Af, Ag	Slight	Slight	Slight	Slight.
Agua variant: Ah	Moderate: wet	Moderate: wet	Moderate: wet	Moderate: wet.
*Akela: AkC For Rock outcrop part, see Rock outcrop.	Severe: small stones.	Severe: small stones.	Severe: small stones.	Moderate: small stones.
Alemeda: AmB	Slight	Slight	Moderate: depth to rock.	Slight.
Anapra: An, Ao	Slight	Slight	Slight	Slight.
Armijo: Ar	Severe: percs slowly.	Moderate: too clayey.	Severe: percs slowly; dusty.	Moderate: too clayey; dusty.
Badland: Ba	Severe: percs slowly; dusty; slope.	Severe: too clayey; dusty; slope.	Severe: dusty; too clayey; slope.	Severe: dusty; too clayey.
*Bluepoint: Bb, BcA, BCC, Bd3, BKD For Kokan part of BKD, see Kokan series; for Wink part of Bd3, see Wink series.	Severe: dusty; too sandy.	Severe: dusty; too sandy.	Severe: dusty; too sandy.	Severe: dusty; too sandy.
Bond Mapped only with Rock outcrop and Penistaja soils.	Slight if slope is 5 to 8 percent, moderate if 8 to 15.	Slight if slope is 5 to 8 percent, moderate if 8 to 15.	Severe: depth to rock.	Slight.
*Borolls: BOF For Rock outcrop part, see Rock outcrop.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Brazito: Br, Bs, Bt	Slight	Slight	Slight	Slight.
Burnac: BUE	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Carlito: CAF	Severe: slope	Severe: slope	Severe: slope	Moderate if slope is 15 to 25 percent, severe if more than 25.
Cut and fill land: Cu	Moderate: dusty	Moderate: dusty	Severe: slope	Moderate if slope is 15 to 25 percent, severe if more than 25.
*Embudo: EmB, EtC For Tijeras part of EtC, see Tijeras series.	Slight	Slight	Moderate: small stones.	Slight.
Escabosa Mapped only with Laporte and Rock outcrop.	Slight if slope is less than 8 percent, moderate if 8 to 15, severe if more than 15.	Slight if slope is less than 8 percent, moderate if 8 to 15, severe if more than 15.	Moderate if slope is less than 6 percent; depth to rock. Severe if slope is more than 6 percent.	Slight if slope is less than 15 percent, moderate if more than 15.
*Gila: GA, Gb, Gc, Gd, GF	Slight	Slight	Slight	Slight.
Ge, GH For Hantz part of GH, see Hantz series.	Moderate: too clayey; dusty.	Moderate: too clayey; dusty.	Moderate: too clayey; dusty.	Moderate: too clayey; dusty.
Glendale: Gk	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
Gm	Moderate: percs slowly.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.

See footnote at end of table.

TABLE 10.—*Limitations for recreational facilities*—Continued

Soil series and map symbols	Camp areas	Picnic areas	Playgrounds	Paths and trails
Hantz: Ha	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Ildefonso: ILC	Moderate if slope is 1 to 15 percent; small stones. Severe if slope is more than 15 percent.	Moderate if slope is 1 to 15 percent; small stones. Severe if slope is more than 15 percent.	Severe: small stones.	Moderate if slope is 1 to 30 percent; small stones.
*Kim: KaB, KbB, KD For Badland part of KD, see Badland.	Moderate: dusty	Moderate: dusty	Moderate if slope is 0 to 6 percent; dusty. Severe if slope is more than 6 percent.	Moderate: dusty.
*Kokan: KOE, KR For Rock outcrop part of KR, see Rock outcrop.	Severe: small stones.	Severe: small stones.	Severe: small stones; slope.	Severe: small stones.
*Kolob: KS, KT, KU For Rock outcrop part of KT, see Rock outcrop; for Sandia part of KU, see Sandia series.	Severe: slope	Severe: slope	Severe: slope	Moderate if slope is less than 25 percent, severe if more than 25.
Kolob variant: KVE	Severe: slope	Severe: slope	Severe: slope	Moderate if slope is less than 25 percent, severe if more than 25.
La Fonda: La	Slight	Slight	Slight if slope is less than 2 percent, moderate if more than 2.	Slight.
*Laporte: LBE, LRD For Rock outcrop part of LBE and LRD, see Rock outcrop; for Escabosa part of LRD, see Escabosa series.	Slight if slope is less than 8 percent, moderate if 8 to 15, severe if more than 15.	Slight if slope is less than 8 percent, moderate if 8 to 15, severe if more than 15.	Severe: depth to rock.	Slight if slope is less than 15 percent, moderate if 15 to 25, severe if more than 25.
Latene: LtB	Slight	Slight	Slight if slope is less than 2 percent, moderate if 2 to 5.	Slight.
*Madurez: MaB, MbC, MWB For Bluepoint part of MbC, see Bluepoint series; for Wink part of MWB, see Wink series.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
MWA For Wink part, see Wink series.	Slight	Slight	Slight if slope is less than 2 percent, moderate if 2 to 5.	Slight.
Manzano: Mz	Severe: floods	Moderate: floods	Moderate: floods	Slight.
Millett: Mapped only with Tesajo soils.	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
Nickel: NL For Latene part, see Latene series.	Moderate: small stones. Severe if slope is more than 15 percent.	Moderate: small stones. Severe if slope is more than 15 percent.	Severe: small stones.	Moderate if slope is less than 25 percent; small stones. Severe if slope is more than 25 percent.
Orthids: Mapped only with Rock outcrop.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.

See footnote at end of table.

TABLE 10.—*Limitations for recreational facilities*—Continued

Soil series and map symbols	Camp areas	Picnic areas	Playgrounds	Paths and trails
Otero: OT	Slight	Slight	Slight if slope is less than 2 percent, moderate if 2 to 6, severe if more than 6.	Slight.
Pajarito:				
PAC	Moderate: too sandy.	Moderate: too sandy.	Moderate if slope is less than 6 percent; too sandy. Severe if slope is more than 6 percent.	Moderate: too sandy.
PbB	Slight	Slight	Slight if slope is less than 2 percent, moderate if 2 to 5.	Slight.
*Penistaja:				
PEB	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
PFB, PG For Bond part of PG, see Bond series.	Slight	Slight	Slight if slope is less than 2 percent, moderate if 2 to 5.	Slight.
*Pino: PR For Rock outcrop part, see Rock outcrop.	Moderate: percs slowly.	Slight if slope is less than 8 percent, moderate if 8 to 15.	Moderate if slope is less than 6 percent; slope. Severe if slope is more than 6 percent.	Slight.
*Rock outcrop: Ra, RBE, RCE, RLF, ROF, RUF. For Akela part of RBE, see Akela series; for Bond part of RCE, see Bond series; for Laporte part of RLF, see Laporte series; for Orthids part of ROF, see Orthids; for Ustolls part of RUF, see Ustolls.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Salas: SAF	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
*Sandia: SBE For Kolob part, see Kolob series.	Severe: slope	Severe: slope	Severe: slope	Moderate if slope is less than 25 percent; large stones. Severe if slope is more than 25 percent.
*Scholle: SC For Ildefonso part, see Ildefonso series.	Moderate: small stones.	Moderate: small stones.	Moderate if slope is less than 6 percent; small stones. Severe if slope is more than 6 percent.	Moderate: small stones.
*Seis: SEC, SFE, SGE, SHF For Silver part of SGE, see Silver series.	Moderate if slope is less than 15 percent; small stones. Severe if slope is more than 15 percent.	Moderate if slope is less than 15 percent; small stones. Severe if slope is more than 15 percent.	Severe: small stones.	Moderate if slope is less than 25 percent; small stones. Severe if slope is more than 25 percent.
*Shingle: SkE, SL For Badland part of SkE see Badland; for Kim part of SL, see Kim series.	Moderate: too clayey.	Moderate: too clayey.	Severe: depth to rock.	Moderate: too clayey.

See footnote at end of table.

TABLE 10.—*Limitations for recreational facilities*—Continued

Soil series and map symbols	Camp areas	Picnic areas	Playgrounds	Paths and trails
*Silver: SmA, SnA, SwB, SwC For Witt part of SwB and SwC, see Witt series.	Moderate: percs slowly.	Slight	Moderate if slope is less than 6 percent; percs slowly. Severe if slope is more than 6 percent.	Slight.
*Tesajo: Te For Millett part, see Millett series.	Moderate if slope is 3 to 15 percent; small stones.[1] Severe if slope is more than 15 percent.	Moderate if slope is 3 to 15 percent; small stones.[1] Severe if slope is more than 15 percent.	Severe: small stones.	Moderate: small stones.
Tijeras: TgB	Slight	Slight	Moderate if slope is 0 to 6 percent; small stones. Severe if slope is more than 6 percent.	Slight.
Tome: To	Severe: floods	Moderate: floods	Moderate: percs slowly.	Slight.
Torrifluvents: TP	Severe: floods	Severe: floods	Severe: floods	Severe: floods.
*Travessilla: TQC, TR For Rock outcrop part of TR, see Rock outcrop.	Slight if slope is less than 8 percent, moderate if more than 8.	Slight if slope is less than 8 percent, moderate if more than 8.	Severe: depth to rock.	Slight.
Ustolls Mapped only with Rock outcrop.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; rock outcrop.
*Vinton:				
Va, Vc	Moderate: too sandy or too clayey.	Moderate: too sandy or too clayey.	Moderate: too sandy or too clayey.	Moderate: too sandy or too clayey.
VbA, VBB	Slight	Slight	Slight	Slight.
VF For Brazito part of VF, see Brazito series.	Severe: floods	Moderate: floods	Severe: floods	Slight.
*Wink: WaB, WeB, WM For Embudo part of WeB, see Embudo series; for Madurez part of WM, see Madurez series.	Moderate: dusty	Moderate: dusty	Moderate if slope is less than 6 percent; dusty. Severe if slope is more than 6 percent.	Moderate: dusty.
Witt Mapped only with Silver soils.	Moderate: percs slowly.	Slight	Moderate if slope is less than 6 percent; percs slowly. Severe if slope is more than 6 percent.	Slight.

[1] Some local areas are subject to flooding.

ranges from 40° F in the Sandia Mountains to 60° in the Rio Grande Valley.

Climate directly influences soil formation. The amount of precipitation and the temperature largely determine the kind and amount of vegetation that grows. The amount of precipitation determines the amount of leaching of bases, the accumulation of carbonates, and the movement of clay colloids in the soil. Warm, moist climates increase the rate at which organic matter decomposes and parent material weathers.

The sparse grassland vegetation in aridic areas produces little organic matter. Many of the soils formed in these areas, such as Madurez and Wink soils, have a light colored surface horizon that is only about 0.25 percent organic matter. The Sandia, Manzanita, and Manzano Mountains receive more precipitation, and the denser stands of grasses, trees, and shrubs produce more organic matter. Sandia and Kolob soils and the Kolob variant, which formed in these areas, have a dark colored surface horizon that is more than 1 percent organic matter.

The amount of precipitation largely determines the amount and extent of downward leaching of calcium carbonate in the soil profile. Madurez and Wink soils, formed under 7 to 10 inches of precipitation, are moderately alkaline and have moderate or strong (15 to 30 percent calcium carbonate equivalent) zones of calcium carbonate accumulation below a depth of 20 inches. The Kolob variant, formed under 25 to 30 inches precipitation, is only neutral or mildly alkaline and has no distinct zone of calcium carbonate accumulation. Also, more clay moves into the B2t horizon than in Madurez or Wink soils.

Basalt and limestone bedrock weathers fairly rapidly in humid climates, but is more resistant to weathering in arid regions. Akela soils are shallow to basalt, and Escabosa, Laporte, and Seis soils are shallow or moderately deep to limestone.

Plant and animal life

Plant and animal life are active factors in soil formation. Plant roots grow down into the parent material, break up the soil, rearrange soil particles, force openings in the soil, and make the soil more porous. They also bring plant nutrients from lower horizons to upper horizons. Animals burrow in the soil and mix it. Man changes soil by leveling, tilling, and irrigating and by planting different crops. Earthworms, bacteria, and fungi live in the soil, feed on the organic matter, and recycle plant nutrients. The organic matter in the soil comes from the decay of dead plants and animals.

Vegetation, mainly grass, is the major biotic influence in this area. Kokan and Latene soils formed under a sparse stand of grass and consequently have a light colored surface horizon that has low organic-matter content. Manzano soils formed under a moderate stand of grass and have a dark colored surface horizon that has moderate organic-matter content.

Relief

Relief is the inequalities and relative differences in elevation of a land surface. Relief in the survey area ranges fro n less than 1 percent slope in the Rio Grande Valley, at elevations of 4,850 to 5,350 feet, to 15 to 75 percent slope in the Sandia Mountains, at elevations of 6,000 to 10,678 feet. Slope is dominantly 1 to 9 percent and elevation 5,000 to 6,000 feet.

Relief influences soil formation by affecting surface runoff, internal drainage, erosion, and soil temperature. Variations in these components cause differences in thickness of the surface horizon, depth of solum, degree of horizon differentiation, and in some places, the nature of the parent material. For example, the average depth to the water table under the flat flood plain of the Rio Grande is 7 to 9 feet, but ranges from about 2 to 18 feet. The shallow water table is largely responsible for the saline and alkali conditions that affect about 20 percent of the soils on this flood plain.

Madurez and Wink soils are geographically associated. Typically, Madurez soils are in concave areas and Wink soils are in adjacent convex areas. As a result, Madurez soils receive runoff from Wink soils, and this increase in soil moisture produces more weathering and leaching and a stronger degree of horizon differentiation in Madurez soils.

Escabosa and Laporte soils have 3 to 45 percent slope and are on the foothills of the Manzano and Manzanita Mountains. They are gravelly and shallow or moderately deep to limestone bedrock. The amount of these soils removed by geologic erosion is nearly equal to the amount formed from the weathering of underlying bedrock.

Time

Time is required for soils to form from parent material. The length of time depends on the degree of expression of the other soil-forming factors. The soils in this area range from young soils that have little or no horizon differentiation to older soils that have distinct horizon differentiation.

Gila and Glendale soils are young soils that formed in stratified, calcareous loamy and silty sediments along the flood plain of the Rio Grande. They retain most of the characteristics of the parent material, but have a slightly darker surface layer caused by accumulated organic matter and have some weak structure in the thin platy strata.

Silver soils are older soils that formed in clay loam. Carbonates are leached to about 18 inches, and a brown or light brown silty clay loam B2t horizon is at a depth of about 5 to 31 inches.

Classification of the Soils

Soils are classified according to a system designed to make it easier to remember significant soil characteristics and to see the relationships of soils to one another and to the whole environment. Classification is useful in understanding soil behavior and response to management and in applying that knowledge to specific fields and other tracts of land through the use of soil maps. Soils are placed in narrow categories, such as those used in detailed soil surveys, to organize and apply knowledge about soils to the management of farms, fields, and woodland; to the development of rural areas; to engineering work; and to many other uses. Soils are placed in broad classes to facilitate study and comparison in large areas such as countries and continents (*3*).

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965 (*6*). Readers interested in further details about the system should refer to the latest literature available.[10]

The current system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. The criteria for classification are soil properties that can be observed in the field or that can be inferred either from other observable properties or from the combined data of soil science and other disciplines. The properties selected for high categories are those that affect soil genesis or are the result of soil genesis (*2*). In table 11 the soil series of the area are assigned to categories according to the current system. These categories are briefly defined in the following paragraphs.

ORDER.—Ten soil orders are recognized. The properties used to differentiate these soil orders are those that group soils according to the kind and degree of the dominant

[10] See the unpublished working document, "Selected Chapters from the Unedited Text of the Soil Taxonomy" available in the SCS State Office, Albuquerque, New Mexico.

TABLE 11.—*Classification of soils*

Series	Family	Subgroup	Order
Agua	Coarse-loamy over sandy or sandy-skeletal, mixed (calcareous), thermic.	Typic Torrifluvents	Entisols.
Agua variant	Coarse-loamy over sandy or sandy-skeletal, mixed (calcareous), thermic.	Aquic Ustifluvents	Entisols.
Akela	Loamy-skeletal, mixed (calcareous), thermic	Lithic Torriorthents	Entisols.
Alemeda	Loamy-skeletal, mixed, thermic	Typic Calciorthids	Aridisols.
Anapra [1]	Fine-silty over sandy or sandy-skeletal, mixed (calcareous), thermic.	Typic Torrifluvents	Entisols.
Armijo	Fine, montmorillonitic, thermic	Typic Torrerts	Vertisols.
Bluepoint [2]	Mixed, thermic	Typic Torripsamments	Entisols.
Bond	Loamy, mixed, mesic	Lithic Ustollic Haplargids	Aridisols.
Brazito	Mixed, thermic	Typic Torripsamments	Entisols.
Burnac	Fine, montmorillonitic	Mollic Eutroboralfs	Alfisols.
Carlito	Fine, mixed, mesic	Ustollic Haplargids	Aridisols.
Embudo	Coarse-loamy, mixed, nonacid, thermic	Typic Torriorthents	Entisols.
Escabosa	Fine-loamy, mixed, mesic	Aridic Calciustolls	Mollisols.
Gila [2 3]	Coarse-loamy, mixed (calcareous), thermic	Typic Torrifluvents	Entisols.
Glendale	Fine-silty, mixed (calcareous), thermic	Typic Torrifluvents	Entisols.
Hantz [2]	Fine, mixed (calcareous), thermic	Typic Torrifluvents	Entisols.
Ildefonso	Loamy-skeletal, mixed, mesic	Ustollic Calciorthids	Aridisols.
Kim	Fine-loamy, mixed (calcareous), mesic	Ustic Torriorthents	Entisols.
Kokan [2]	Sandy-skeletal, mixed, thermic	Typic Torriorthents	Entisols.
Kolob	Clayey-skeletal, montmorillonitic	Typic Argiborolls	Mollisols.
Kolob variant	Clayey-skeletal, mixed	Argic Cryoborolls	Mollisols.
La Fonda	Fine-loamy, mixed, mesic	Ustollic Camborthids	Aridisols.
Laporte	Loamy, mixed, mesic	Lithic Haplustolls	Mollisols.
Latene	Coarse-loamy, mixed, thermic	Typic Calciorthids	Aridisols.
Madurez [4]	Fine-loamy, mixed, thermic	Typic Haplargids	Aridisols.
Manzano	Fine-loamy, mixed, mesic	Cumulic Haplustolls	Mollisols.
Millett	Fine-loamy, mixed, mesic	Ustollic Haplargids	Aridisols.
Nickel	Loamy-skeletal, mixed, thermic	Typic Calciorthids	Aridisols.
Otero	Coarse-loamy, mixed (calcareous), mesic	Ustic Torriorthents	Entisols.
Pajarito	Coarse-loamy, mixed, thermic	Typic Camborthids	Aridisols.
Penistaja [5]	Fine-loamy, mixed, mesic	Ustollic Haplargids	Aridisols.
Pino [6]	Fine, mixed	Typic Argiborolls	Mollisols.
Salas	Loamy-skeletal, mixed, mesic	Aridic Argiustolls	Mollisols.
Sandia	Loamy-skeletal, mixed	Typic Haploborolls	Mollisols.
Scholle	Fine-loamy, mixed, mesic	Ustollic Haplargids	Aridisols.
Seis	Loamy-skeletal, mixed, mesic	Ustollic Calciorthids	Aridisols.
Shingle	Loamy, mixed (calcareous), mesic, shallow	Ustic Torriorthents	Entisols.
Silver	Fine, mixed, mesic	Ustollic Haplargids	Aridisols.
Tesajo	Loamy-skeletal, mixed, mesic	Cumulic Haplustolls	Mollisols.
Tijeras	Fine-loamy, mixed, thermic	Typic Haplargids	Aridisols.
Tome	Fine-silty, mixed (calcareous), thermic	Typic Torriorthents	Entisols.
Travessilla	Loamy, mixed (calcareous), mesic	Lithic Ustic Torriorthents	Entisols.
Vinton	Sandy, mixed, thermic	Typic Torrifluvents	Entisols.
Wink	Coarse-loamy, mixed, thermic	Typic Calciorthids	Aridisols.
Witt	Fine-silty, mixed, mesic	Ustollic Haplargids	Aridisols.

[1] Some soils are taxadjuncts to the series because they have hue of 5YR.

[2] Some soils are taxadjuncts to their respective series because their annual temperature is a few degrees cooler than is defined as the range for the series.

[3] Some soils are taxadjuncts to the series because they are 18 to 24 percent clay, which is more than is defined as the range for the series.

[4] Some soils are taxadjuncts to the series because they have a Cca horizon that has less lime than is defined as the range for the series.

[5] Some soils are taxadjuncts to the series because they are coarser textured than is defined as the range for the series.

[6] Some soils are taxadjuncts to the series because their annual temperature is a few degrees warmer than is defined as the range for the series.

soil-forming processes that have been active. The names of orders end in *sol*. An example is Aridisol.

SUBORDER.—Each order is divided into suborders, primarily on the basis of properties that influence soil genesis and are important to plant growth. The suborders are also divided on the basis of the most important variables within the orders. The names of suborders have two syllables. The last syllable indicates the order. An example is Orthid (*Orth*, meaning common, and *id*, from Aridisol).

GREAT GROUP.—Soil suborders are divided into great groups on the basis of close similarities in the kind, arrangement, and degree of expression of pedogenic horizons; in soil moisture and temperature; and in base status. The names of great groups end with the name of a suborder. A prefix added to the name suggests something about the properties of the soil. An example is Calciorthid (*Calc*, meaning lime, and *orthid*, a suborder of Aridisols common in the present environment.)

SUBGROUP.—Great groups are divided into three kinds of subgroups. These subgroups are the central, or typic, segment of the group, which is not necessarily the most extensive subgroup; the intergrades, or transitions to

other orders, suborders, or great groups; and the extragrade subgroups, which have some properties representative of the great group but are not transitions to any other known kind of soil. The names of subgroups are derived by placing one or more adjectives before the name of the great group. The adjective Typic is used for the subgroup that is thought to typify the great group. An example is Typic Calciorthids.

FAMILY.—Soil families are separated within a subgroup on the basis of physical and chemical properties that are so similar that responses to management are nearly the same for comparable phases. Among the properties considered are major biological activity below plow depth, particle-size distribution, mineralogy, soil temperature, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of a series of adjectives and the name of a subgroup. The adjectives are the class names for such properties as particle size, mineralogy, and reaction, which are used as family differentiae. An example is the coarse-loamy, mixed, thermic family of Typic Calciorthids.

SERIES.—The series consists of a group of soils that formed in a particular kind of parent material and have horizons that, except for texture of the surface layer, are similar in arrangement in the profile and in such differentiating characteristics as color, texture, structure, reaction, consistence, and mineralogical and chemical composition. The name of a series is a place name taken from the area where the soil was first observed and mapped. An example is Tijeras series.

Environmental Features that Affect Soil Use

The Spanish came into the area in 1540 to establish missions. They raised corn, beans, squash, and chile peppers on the fertile soils of the Rio Grande Valley. The valley is identified on the general soil map as association 1.

Population began to increase shortly after World War I, when the automobile and Highway 66 improved transportation facilities. During World War II the Sandia and Manzano military bases and the Special Weapons Center began an expansion around the City of Albuquerque, which by 1971 had a population of 325,000, the largest in New Mexico. The Atchison-Topeka and Santa Fe Railroad still serves the area, and Interstate Highways 25 and 40 cross in the city. Four major commercial airlines also serve the area through the Albuquerque International Sunport. Although farming is not now of major significance, it persists in the form of irrigated pasture and silage crops, which support the dairy farms, and some truck crops and private garden plots.

Climate[11]

The Rio Grande flows southward through the center of Bernalillo County, which is in the central part of New Mexico. The land rises on both sides of the river and forms mesas that have elevations of about 5,000 feet. To the east, the mesa is narrow and is just beyond the Sandia and Manzano Mountains. Tijeras Canyon, a main east-west highway pass, separates these two ranges. Sandia Crest peaks at 10,678 feet, and forested mountain slopes decrease in elevation eastward in the central highlands. The valley and mesa areas are arid, having average annual precipitation near 8 inches. In the mountains to the east, average annual precipitation ranges from 15 to 30 inches; the amount generally increases with increasing elevation.

Table 12 shows the annual patterns of precipitation and temperature at Albuquerque, which are representative of other valley and mesa localities. For comparison, table 13 shows other selected climatological data.

Summer is the rainy season. Half the average annual precipitation falls during the period July to October, typically as brief but often heavy thunderstorms. An average of 44 such storms occur each year, mostly during this period. Moisture is supplied by the general southeasterly circulation of moist air over the Gulf of Mexico from the Bermuda high pressure area, which shifts westward in summer. Winter precipitation is light because much of the moisture from storms over the Pacific Ocean falls over the mountains west of New Mexico as the storms move eastward. Precipitation is more evenly distributed throughout the year at higher elevations in the eastern part of the country. June is the driest month in the mountains. November is somewhat drier in the mesas.

There is considerable variation in precipitation from year to year and from month to month. The average 24-hour precipitation amount is 2 or 3 inches, but an unofficial amount of 4 inches has been reported. The average number of days having 0.10 inch or more precipitation ranges from 22 in the valley to 54 in the mountains. The average number of days having precipitation of 0.50 inch or more ranges from 2 in the valley to 17 at Sandia Crest.

Average annual snowfall ranges from near 10 inches in the valley to 3 feet in the foothills and to near 10 feet in the higher mountains. In 1958, the maximum annual snowfall was 26.5 inches at Albuquerque and 215.8 inches at Sandia Crest. The maximum snowfall in 1 month was 14.7 inches in Albuquerque in December 1959 and 67.9 inches at Sandia Crest in March 1958. The snow season in the valley generally extends from November to early in April, but snow seldom stays on the ground for more than 1 day. In the higher mountains snow usually persists to allow skiing fro n late in November to early in April.

Average annual temperature ranges from 57° F at Albuquerque to 50° in the foothills and 40° at Sandia Crest. The highest recorded temperature at Albuquerque is 104° and at Sandia Crest, about 15 miles away, 80°. The lowest recorded temperatures range from −17° at Albuquerque to −29° at low spots in the foothills and −19° at Sandia Crest. The temperature reaches 90° on an average of 75 days a year, June through August, at Albuquerque and on an average of 34 days in the foothills. Freezing temperatures occur on an average of 105 days each year, in November to early in April, at Albuquerque and on an average of 196 days at Sandia Crest.

The average frost-free season at Albuquerque is 190 days, from mid-April to late in October, and the average frost-free season in the mountains is about 120 days,

[11] By FRANK E. HOUGHTON, climatologist for New Mexico, National Weather Service, U.S. Department of Commerce.

TABLE 12.—*Climatic data*

[All data from Albuquerque International Sunport, Bernalillo County, New Mexico, elevation 5,314 feet, for the period August 1939 through December 1970]

Month	Temperature					Precipitation		
	Average daily maximum	Average daily minimum	Daily mean	Extreme maximum	Extreme minimum	Average total	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Inches		Inches
January	47	24	35	68	[1] −7	0.31	1	1.8
February	53	27	40	72	−5	.40	2	1.7
March	59	32	46	81	8	.47	2	1.7
April	70	41	56	89	19	.47	2	.3
May	80	51	65	98	28	.56	2	[2]
June	89	60	75	102	43	.53	1	0
July	92	65	79	104	54	1.37	4	0
August	90	63	77	100	52	1.38	4	0
September	83	57	70	98	37	.83	4	[2]
October	72	45	58	87	25	.78	2	[2]
November	57	32	44	74	10	.34	1	1.2
December	48	25	37	72	3	.52	2	2.6

[1] An extreme minimum of −17° was subsequently recorded on Janury 7, 1971. [2] Trace.

TABLE 13.—*Annual averages of temperature and precipitation* [1]

[For Bernalillo County, New Mexico]

Station	Elevation	Temperature			Precipitation		Average date of—		Average number of frost-free days
		Average maximum	Average minimum	Years of record	Average annual	Years of record	Last freezing temperature in spring	First freezing temperature in fall	
	Feet	°F	°F	Number	Inches	Number			
Albuquerque International Sunport.	5,314	70	44	21	7.88	21	April 16	October 29	196
Barton	6,875	64	37	11	15.90	12	May 11	October 14	156
Experiment Farm	4,928	71	36	19	6.82	19	April 24	October 10	169
Netherwood Park	5,130	72	40	22	8.32	22	April 16	October 24	191
Rio Grande Industrial School.	5,000	70	36	10	8.31	10	May 8	October 12	157
Sandia Park	7,130	65	33	18	18.16	19	May 17	October 7	143
Sandia Ranger Station.	6,300	66	32	36	14.61	49	May 22	September 30	131

[1] Period of record: Barton, 1914–1925; Experiment Farm, 1938–1957; Netherwood Park, 1935–1957; Rio Grande Industrial School, 1911–1921; Sandia Park, 1954–1965; Albuquerque International Sunport and Sandia Ranger Station, 1939–1960.

from late in May to early in October. Temperatures are generally mild at the lower elevations, and nights cool rapidly after sundown. Large diurnal and annual ranges in temperature, which are characteristic of a continental climate, occur in the area. Albuquerque, for example, has an average diurnal temperature range of 27 degrees.

Average annual relative humidity at Albuquerque is 43 percent, but ranges from near 60 percent early in the morning to nearly 30 percent in the afternoon. In June, the average afternoon relative humidity is nearly 20 percent and occasionally falls as low as 4 percent.

Sunshine occurs more than 75 percent of the possible hours, or nearly 3,400 hours a year, and is fairly evenly distributed in all seasons.

The average annual windspeed is 9 miles per hour. Spring is the windy season, and if weather is dry, soil blows occasionally. A brief period of soil blowing can also occur just before a thunderstorm. Winds blow most frequently from the north in winter, and from the south along the river valley in summer. In Tijeras Canyon the heavy cold air held back by the Sandia and Manzano Mountains finds access to the basin and literally pours through the Canyon, spreading out on the mesa and valley below in gusts of up to 50 miles per hour.

Literature Cited

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(2) Cline, Arvad J. and Johnson, Donal D. 1963. Threads of genesis in the seventh approximation. Soil Sci. Soc. of Am. Proc. 27: 220–222.

(3) Kellogg, Charles E. 1963. Why a new system of classification? Soil Sci. 96: 1–5.

(4) Portland Cement Association. 1962. PCA Soil Primer. 52 pp., illus.

(5) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplement issued in May 1962]

(6) ———— 1960. Soil classification, a comprehensive system, 7th approximation. 265 pp., illus. [Supplements issued in March 1967 and in September 1968]

(7) United States Department of Defense. 1968. Unified soil classification system for roads, airfields, embankments and foundations. MIL–STD–619B, 30 pp., illus.

Glossary

Alkali soil. An alkali soil has so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases) that the growth of most crop plants is low.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Area reclaim. Borrow areas hard to reclaim after the removal of soil for construction and other uses.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Buried soil. A developed soil, once exposed but now overlain by more recently formed soil.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A mapping unit consisting of different kinds of soils that occur in such small individual areas or in such an intricate pattern that they cannot be shown separately on a publishable soil map.

Compressible. Excessive decrease in soil volume under load.

Corrosive. Soil corrodes uncoated steel pipe.

Cutbanks cave. Walls of cuts not stable.

Depth, soil. The depth to underlying bedrock, hardpan, or other restrictive layer. The depth classes used in this survey are as follows:

Very shallow	Less than 10 inches.
Shallow	10 to 20 inches.
Moderately deep	20 to 40 inches.
Deep	More than 40 inches.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

Dispersion, soil. Deflocculation of the soil and its suspension in water.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by wind (sand blast), running water, and other geological agents.

Excess alkali. Excess exchangeable sodium. The resulting poor physical properties restrict the growth of plants.

Excess fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Excess salts. Excess water soluble salts. Excessive salts restrict the growth of most plants.

Forb. A herbaceous plant that is not a grass, sedge, or rush.

Gravelly soil. From 15 to 50 percent of soil, by volume, consists of rounded or subrounded rock fragments ranging from 2 millimeters to 3 inches in diameter.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Low strength. Inadequate strength for supporting loads.

Percolation. The downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables a soil to transmit air and water. Terms used to describe permeability are as follows: *Very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Piping. Formation by moving water of tunnels or pipelike cavities in the soil.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4. 5	Neutral	6. 6 to 7. 3
Very strongly acid.	4. 5 to 5. 0	Mildly alkaline	7. 4 to 7. 8
Strongly acid	5. 1 to 5. 5	Moderately alkaline	7. 9 to 8. 4
Medium acid	5. 6 to 6. 0	Strongly alkaline	8. 5 to 9. 0
Slightly acid	6. 1 to 6. 5	Very strongly alkaline.	9. 1 and higher

Riparian land. Land situated along the bank of a stream.

Runoff (hydraulics). The part of the precipitation upon a drainage area that is discharged from the area in stream channels. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Seepage. In table 8, the rapid movement of water through the soil. Seepage adversely affects the specified use.

Shale. A sedimentary rock formed by the hardening of clay deposits.

Shrink swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.005 millimeter). As a textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slope, soil. The classes of slope used in this survey area are as follows:

Slope	*Single slopes*	*Complex slopes*
0–1 percent	Level	Level.
1–3 percent	Nearly level	Gently undulating.
3–5 percent	Gently sloping	Undulating.
5–9 percent	Moderately sloping	Gently rolling.
9–15 percent	Strongly sloping	Rolling.
15–30 percent	Moderately steep	Hilly.
30–50 percent	Steep	Steep.
50–80	Very steep	Very steep.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

Soil blowing. Soil is moved and deposited by wind.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equa mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles) adhering together without any regular cleavage (as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Texture, soil. The relative proportions of sand, silt, and clay particles in a soil. The basic soil textural class names, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by adding the words "coarse," "fine," or "very fine." The textural classes may be modified by the addition of suitable adjectives if a significant number of coarse fragments are in the soil, Gravelly silt loam is an example. The basic soil textural classes may be grouped into three general groups: sandy soils (sand, loamy sand); loamy soils (sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, silty clay loam); and clayey soils (sandy clay, silty clay, clay).

Thin layer. Otherwise suitable soil material too thin for the specified use.

Unstable fill. Risk of caving or sloughing in banks of fill material.

GUIDE TO MAPPING UNITS

For complete information about a mapping unit, read both the description of the mapping unit and that of the soil series to which it belongs.

HIGH-INTENSITY SURVEY

Map symbol	Mapping unit	Described on page	Irrigated capability unit Symbol	Irrigated capability unit Page	Dryland capability subclass Symbol	Native plant community Symbol	Native plant community Page
Af	Agua loam	9	IIs-4	47	------	--	--
Ag	Agua silty clay loam	9	IIs-4	47	------	--	--
Ah	Agua loam, wet variant	10	IVw-1	48	------	--	--
AkC	Akela-Rock outcrop complex, 1 to 9 percent slopes	10	-------	--	VIIs	--	--
	Akela soil	--	-------	--	------	8	51
	Rock outcrop	--	-------	--	------	--	--
AmB	Alemeda sandy loam, 0 to 5 percent slopes	11	-------	--	VIIe	4	51
An	Anapra silt loam	12	IIs-4	47	------	--	--
Ao	Anapra silty clay loam	12	IIs-4	47	------	--	--
Ar	Armijo clay loam	12	IIIs-1	47	------	--	--
Ba	Badland	12	-------	--	VIIIe	--	--
Bb	Bluepoint fine sand, hummocky	13	-------	--	VIIe	2	50
BcA	Bluepoint loamy fine sand, 1 to 3 percent slopes	13	IIIe-11	47	------	--	--
Bd3	Bluepoint-Wink, severely eroded complex	13	-------	--	VIIe	--	--
	Bluepoint soil	--	-------	--	------	2	50
	Wink soil	--	-------	--	------	6	51
Br	Brazito fine sandy loam	15	IIIs-8	48	------	--	--
Bs	Brazito silty clay loam	15	IIIs-8	48	------	--	--
Bt	Brazito complex	15	IVe-11	48	------	--	--
Cu	Cut and fill land	17	-------	--	VIIe	--	--
EmB	Embudo gravelly fine sandy loam, 0 to 5 percent slopes	18	-------	--	VIIe	4	51
EtC	Embudo-Tijeras complex, 0 to 9 percent slopes	18	-------	--	VIIe	4	51
Gb	Gila loam	19	I	46	------	--	--
Gc	Gila loam, slightly saline	19	IIs-5	47	------	--	--
Gd	Gila loam, moderately alkali	19	IIIs-10	48	------	--	--
Ge	Gila clay loam	19	I	46	------	--	--
Gk	Glendale loam	20	I	46	------	--	--
Gm	Glendale clay loam	20	I	46	------	--	--
Gs	Glendale clay loam, slightly saline	21	IIs-5	47	------	--	--
Ha	Hantz silty clay loam	21	-------	--	VIIs	1	50
KaB	Kim fine sandy loam, 1 to 8 percent slopes	22	-------	--	VIe	9	52
KbB	Kim silty clay loam, 3 to 5 percent slopes	22	-------	--	VIe	1	50
La	La Fonda loam	25	-------	--	VIe	9	52
LtB	Latene sandy loam, 1 to 5 percent slopes	26	-------	--	VIIe	4	51
MaB	Madurez loamy fine sand, 1 to 5 percent slopes	27	-------	--	VIIe	6	51
MbC	Madurez-Bluepoint complex, 1 to 9 percent slopes	27	-------	--	VIIe	--	--
	Madurez soil	--	-------	--	------	6	51
	Bluepoint soil	--	-------	--	------	2	50
Mz	Manzano loam	28	-------	--	VIe	9	52
PbB	Pajarito fine sandy loam, 1 to 5 percent slopes	30	-------	--	VIIe	4	51
Ra	Rock outcrop	32	-------	--	VIIIs	--	
SkE	Shingle-Badland complex, eroded, 2 to 40 percent slopes	37	-------	--	VIIe	--	--
	Shingle soil	--	-------	--	------	9	52
	Badland soil	--	-------	--	------	--	--
SmA	Silver fine sandy loam, 0 to 2 percent slopes	38	-------	--	VIe	9	52
SnA	Silver fine sandy loam, moderately alkali, 0 to 2 percent slopes	38	-------	--	VIs	1	50
SwB	Silver and Witt soils, 2 to 5 percent slopes	38	-------	--	VIe	9	52
SwC	Silver and Witt soils, 5 to 9 percent slopes	38	-------	--	VIe	9	52
Te	Tesajo-Millett stony sandy loams	39	-------	--	VIIe	5	51

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Irrigated capability unit		Dryland capability subclass	Native plant community	
			Symbol	Page	Symbol	Symbol	Page
TgB	Tijeras gravelly fine sandy loam, 1 to 5 percent slopes	41	-------	--	VIIe	4	51
To	Tome very fine sandy loam	41	-------	--	VIIe	4	51
Va	Vinton loamy sand	43	IIIe-11	47	------	--	--
VbA	Vinton sandy loam, 0 to 1 percent slopes	43	IIIe-11	47	------	--	--
Vc	Vinton clay loam	43	IIs-4	47	------	--	--
WaB	Wink fine sandy loam, 0 to 5 percent slopes	44	-------	--	VIIe	4	51
WeB	Wink-Embudo complex, 0 to 5 percent slopes	44	-------	--	VIIe	4	51

MEDIUM-INTENSITY SURVEY

Map symbol	Mapping unit	Described on page	Dryland capability subclass	Native plant community		Timber suitability group
			Symbol	Symbol	Page	Symbol
BCC	Bluepoint loamy fine sand, 1 to 9 percent slopes	13	VIIe	2	50	--
BKD	Bluepoint-Kokan association, hilly	13	VIIe	--	--	--
	Bluepoint soil	--	------	2	50	--
	Kokan soil	--	------	3	50	--
BOF	Borolls-Rock outcrop association, very steep	14	------	--	--	--
	Borolls soil	--	VIIs	11	52	5
	Rock outcrop	--	VIIIs	--	--	--
BUE	Burnac gravelly loam, 20 to 60 percent slopes	16	VIIe	11	52	4
CAF	Carlito complex, 15 to 80 percent slopes	17	VIIe	7	51	--
GA	Gila fine sandy loam	19	VIIe	4	51	--
GF	Gila complex, moderately alkali	20	VIIe	1	50	--
GH	Gila-Hantz complex	20	VIIe	1	50	--
ILC	Ildefonso gravelly sandy loam, 1 to 9 percent slopes	22	VIIe	7	51	--
KD	Kim-Badland association	22	------	--	--	--
	Kim soil	--	VIe	9	52	--
	Badland soil	--	VIIIe	--	--	--
KOE	Kokan gravelly sand, 10 to 40 percent slopes	23	VIIe	3	50	--
KR	Kokan-Rock outcrop association	23	------	--	--	--
	Kokan soil	--	VIIe	3	50	--
	Rock outcrop	--	VIIIs	--	--	--
KS	Kolob stony loam	23	VIIe	11	52	2
KT	Kolob-Rock outcrop association	24	-------	--	--	--
	Kolob soil	--	VIIe	11	52	2
	Rock outcrop	--	VIIIs	--	--	--
KU	Kolob-Sandia association	24	VIIe	11	52	4
KVE	Kolob stony loam, cold variant, 15 to 40 percent slopes	24	VIIe	12	52	3
LBE	Laporte-Rock outcrop complex, 20 to 45 percent slopes	25	VIIs	--	--	--
	Laporte soil	--	------	7	51	--
	Rock outcrop	--	------	--	--	--
LRD	Laporte-Rock outcrop-Escabosa complex, 5 to 20 percent slopes	25	VIIs	--	--	--
	Laporte soil	--	------	7	51	--
	Rock outcrop	--	------	--	--	--
	Escabosa soil	--	------	7	51	--
MWA	Madurez-Wink association, gently sloping	27	VIIe	4	51	--

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Dryland capability subclass	Native plant community		Timber suitability group
			Symbol	Symbol	Page	Symbol
MWB	Madurez-Wink association, undulating	28	VIIe	6	51	--
NL	Nickel-Latene association	29	VIIe	--	--	--
	Nickel soil	--	------	3	50	--
	Latene soil	--	------	4	51	--
OT	Otero fine sandy loam	30	VIIe	9	52	--
PAC	Pajarito loamy fine sand, 1 to 9 percent slopes	30	VIIe	6	51	--
PEB	Penistaja loamy fine sand, 1 to 5 percent slopes	31	VIe	6	51	--
PFB	Penistaja fine sandy loam, 1 to 5 percent slopes	31	VIe	9	52	--
PG	Penistaja-Bond association	31	VIe	9	52	--
PR	Pino-Rock outcrop association	32	------	--	--	--
	Pino soil	--	VIe	10	52	2
	Rock outcrop	--	VIIIs	--	--	--
RBE	Rock outcrop-Akela complex, 10 to 50 percent slopes	32	VIIIs	--	--	--
	Rock outcrop	--	------	--	--	--
	Akela soil	--	------	8	51	--
RCE	Rock outcrop-Bond complex, 5 to 35 percent slopes	33	VIIIs	--	--	--
	Rock outcrop	--	------	--	--	--
	Bond soil	--	------	7	51	--
RLF	Rock outcrop-Laporte complex, 30 to 80 percent slopes	33	VIIIs	--	--	--
	Rock outcrop	--	------	--	--	--
	Laporte soil	--	------	7	51	5
ROF	Rock outcrop-Orthids complex, 40 to 80 percent slopes	33	VIIIs	--	--	--
	Rock outcrop	--	------	--	--	--
	Orthids soil	--	------	7	51	--
RUF	Rock outcrop-Ustolls complex, 15 to 70 percent slopes	34	VIIIs	--	--	--
	Rock outcrop	--	------	--	--	--
	Ustolls soil	--	------	7	51	--
SAF	Salas complex, 20 to 80 percent slopes	34	VIIs	7	51	--
SBE	Sandia-Kolob complex, 15 to 40 percent slopes	35	VIs	11	52	1
SC	Scholle-Ildefonso association	35	VIe	7	51	--
SEC	Seis very cobbly loam, 0 to 15 percent slopes	36	VIIs	7	51	--
SFE	Seis stony loam, 15 to 60 percent slopes	36	VIIe	7	51	--
SGE	Seis-Silver complex, 10 to 40 percent slopes	36	VIIe	7	51	--
SHF	Seis complex, 30 to 80 percent slopes	36	VIIe	7	51	--
SL	Shingle, eroded-Kim association	37	------	9	52	--
	Shingle soil	--	VIIe	--	--	--
	Kim soil	--	VIe	--	--	--
TP	Torrifluvents, frequently flooded	41	VIIIw	--	--	--
TQC	Travessilla fine sandy loam, 1 to 15 percent slopes	42	VIIs	9	52	--
TR	Travessilla-Rock outcrop association	42	------	--	--	--
	Travessilla soil	--	VIIs	9	52	--
	Rock outcrop	--	VIIIs	--	--	--
VBB	Vinton sandy loam, 1 to 3 percent slopes	43	VIIe	2	50	--
VF	Vinton and Brazito soils, occasionally flooded	43	VIIw	13	52	--
WM	Wink-Madurez association	44	VIIe	4	51	--

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SOIL CONSERVATION SERVICE
FOREST SERVICE

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS
BUREAU OF LAND MANAGEMENT

NEW MEXICO AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO

Scale 1:316,800
1 0 1 2 3 4 5 Miles

N

Compiled 1976

SOIL ASSOCIATIONS*

DEEP SOILS ON FLOOD PLAINS AND DISSECTED TERRACES

1 Gila-Vinton-Brazito association: Level or nearly level, well drained loamy soils mainly on the flood plain along the Rio Grande

2 Bluepoint-Kokan association: Nearly level to steep, somewhat excessively drained or excessively drained sandy and gravelly soils on dissected terraces and alluvial fans

3 Hantz-Gila association: Level or nearly level, well drained loamy soils mainly on the flood plain along the Rio Puerco

DEEP SOILS ON ALLUVIAL FANS, MESAS, AND PIEDMONTS

4 Madurez-Wink association: Level to moderately sloping, well drained loamy soils on piedmonts

5 Tijeras-Embudo association: Level to moderately sloping, well drained loamy and gravelly soils on alluvial fans

6 Latene-Nickel association: Nearly level to moderately steep, well drained loamy and gravelly soils on mesas and fans

MODERATELY DEEP OR SHALLOW SOILS ON BASALT FLOWS

7 Alemeda-Akela association: Level to gently rolling, well drained loamy and cobbly soils

VERY SHALLOW TO DEEP SOILS ON UPLANDS

8 Penistaja-Travessilla-Bond association: Deep to very shallow, nearly level to strongly sloping, well drained loamy soils over sandstone

9 Penistaja-Otero association: Deep, nearly level to moderately sloping, well drained loamy soils underlain in places by sandstone

10 Shingle-Kim association: Deep to very shallow, level to gently rolling, well drained loamy soils over shale and sandstone

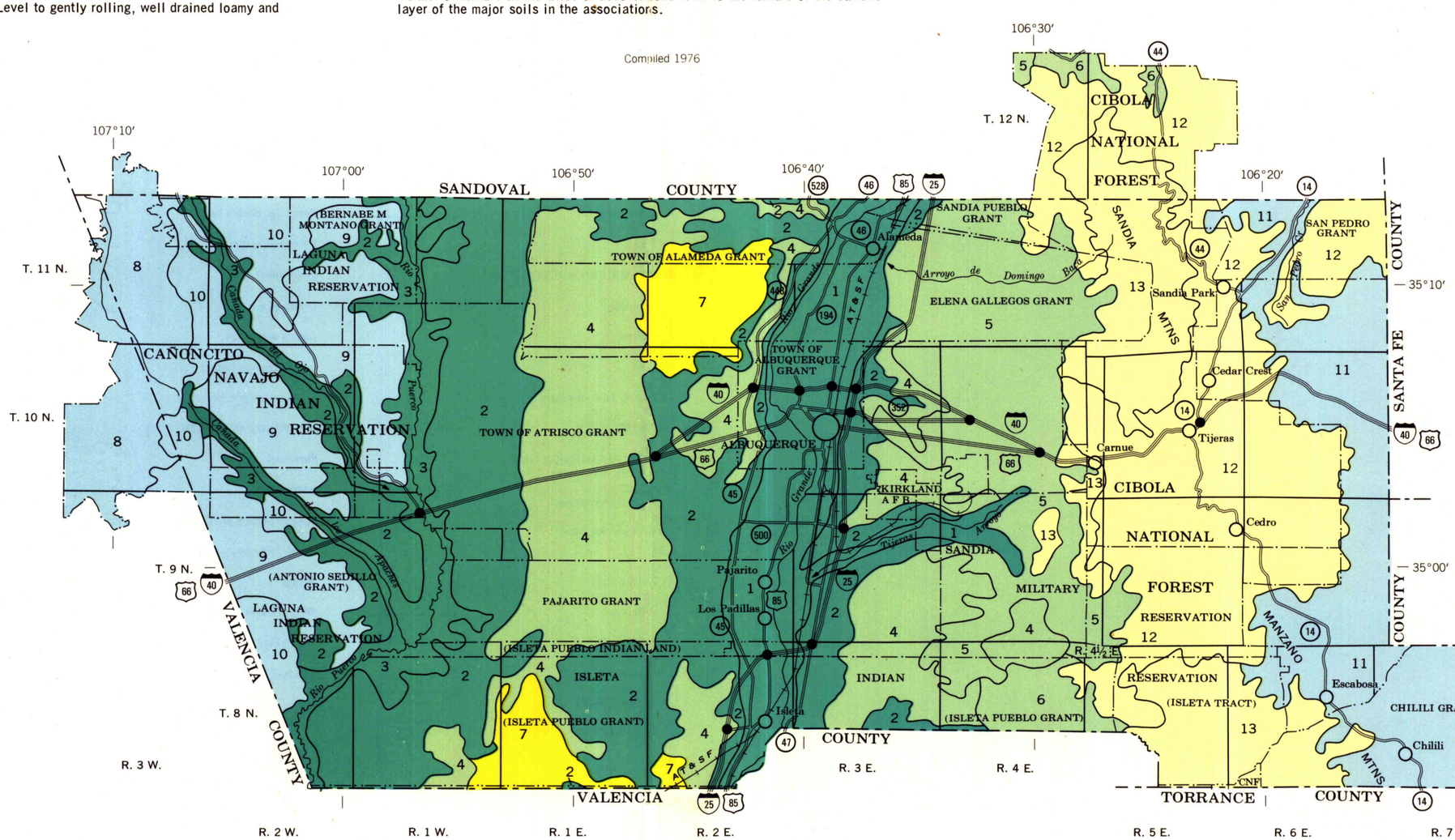
11 Silver-Witt-Laporte association: Deep to very shallow, level to moderately steep, well drained loamy soils underlain in places by limestone

SHALLOW TO DEEP SOILS ON MOUNTAINS AND FOOT SLOPES

12 Seis-Orthids association: Shallow or moderately deep, level to very steep, well drained, very cobbly, stony, and very stony loamy soils

13 Kolob-Rock outcrop association: Deep, moderately steep to very steep, well drained loamy and stony soils and Rock outcrop

* Terms for texture in the titles of associations refer to the texture of the surface layer of the major soils in the associations.



This map is intended for general planning. Each delineation can contain soils that differ from those shown on the map. Refer to the detailed soil map or inspect onsite for more detailed planning.

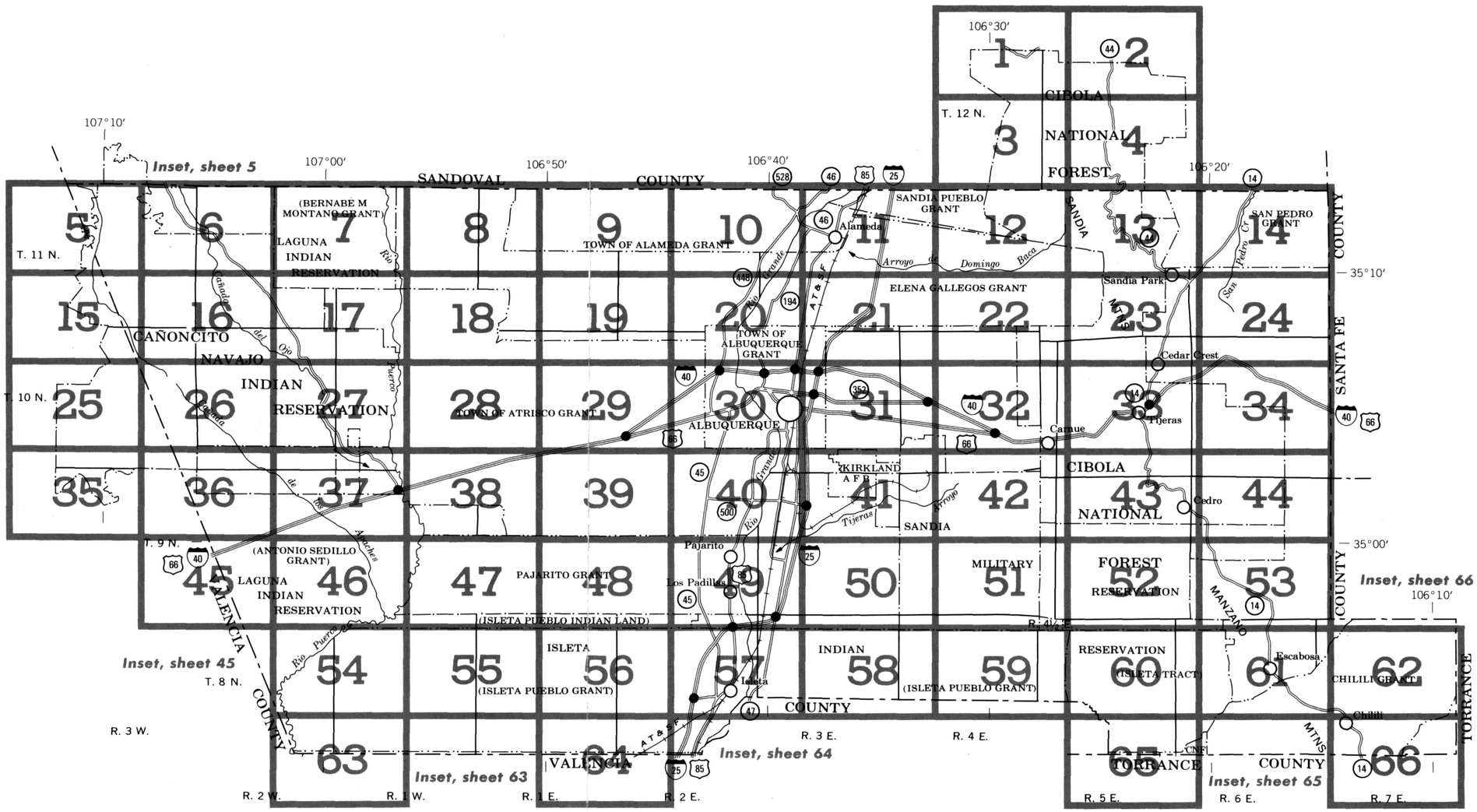
INDEX TO MAP SHEETS

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO

Scale 1:316,800

1 0 1 2 3 4 5 Miles

N



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE AND FOREST SERVICE

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS
BUREAU OF LAND MANAGEMENT
NEW MEXICO AGRICULTURAL EXPERIMENT STATION

SOIL LEGEND

The first letter, always a capital, is the initial letter of the soil name. The second letter is a capital if the map unit is broadly defined; otherwise, it is a lower case letter. A third letter, always a capital A, B, C, D, E or F, shows the slope. Most symbols without slope letters are those of nearly level soils but some are for miscellaneous land types, soil associations, or soil complexes with a considerable range of slope. A final number 3 in the symbol shows that the soil has been severely eroded.

SYMBOL	NAME
Af	Agua loam
Ag	Agua silty clay loam
Ah	Agua loam, wet variant
AkC	Akela-Rock outcrop complex, 1 to 9 percent slopes
AmB	Alemeda sandy loam, 0 to 5 percent slopes
An	Anapra silt loam
Ao	Anapra silty clay loam
Ar	Armijo clay loam
Ba	Badland
Bb	Bluepoint fine sand, hummocky
BcA	Bluepoint loamy fine sand, 1 to 3 percent slopes
BCC	Bluepoint loamy fine sand, 1 to 9 percent slopes
Bd3	Bluepoint-Wink, severely eroded complex
BKD	Bluepoint-Kokan association, hilly
BOF	Borolls-Rock outcrop association, very steep
Br	Brazito fine sandy loam
Bs	Brazito silty clay loam
Bt	Brazito complex
BUE	Burnac gravelly loam, 20 to 60 percent slopes
CAF	Carlito complex, 15 to 80 percent slopes
Cu	Cut and fill land
EmB	Embudo gravelly fine sandy loam, 0 to 5 percent slopes
EtC	Embudo-Tijeras complex, 0 to 9 percent slopes
GA	Gila fine sandy loam
Gb	Gila loam
Gc	Gila loam, slightly saline
Gd	Gila loam, moderately alkali
Ge	Gila clay loam
GF	Gila complex, moderately alkali
GH	Gila-Hantz complex
Gk	Glendale loam
Gm	Glendale clay loam
Gs	Glendale clay loam, slightly saline
Ha	Hantz silty clay loam
ILC	Ildefonso gravelly sandy loam, 1 to 9 percent slopes
KaB	Kim fine sandy loam, 1 to 8 percent slopes
KbB	Kim silty clay loam, 3 to 5 percent slopes
KD	Kim-Badland association
KOE	Kokan gravelly sand, 10 to 40 percent slopes
KR	Kokan-Rock outcrop association
KS	Kolob stony loam
KT	Kolob-Rock outcrop association
KU	Kolob-Sandia association
KVE	Kolob stony loam, cold variant, 15 to 40 percent slopes
La	La Fonda loam
LBE	Laporte-Rock outcrop complex, 20 to 45 percent slopes
LRD	Laporte-Rock outcrop-Escabosa complex, 5 to 20 percent slopes
LtB	Latene sandy loam, 1 to 5 percent slopes
MaB	Madurez loamy fine sand, 1 to 5 percent slopes
MbC	Madurez-Bluepoint complex, 1 to 9 percent slopes
MWA	Madurez-Wink association, gently sloping
MWB	Madurez-Wink association, undulating
Mz	Manzano loam
NL	Nickel-Latene association
OT	Otero fine sandy loam
PAC	Pajarito loamy fine sand, 1 to 9 percent slopes
PbB	Pajarito fine sandy loam, 1 to 5 percent slopes
PEB	Penistaja loamy fine sand, 1 to 5 percent slopes
PFB	Penistaja fine sandy loam, 1 to 5 percent slopes
PG	Penistaja-Bond association
PR	Pino-Rock outcrop association
Ra	Rock outcrop
RBE	Rock outcrop-Akela complex, 10 to 50 percent slopes
RCE	Rock outcrop-Bond complex, 5 to 35 percent slopes
RLF	Rock outcrop-Laporte complex, 30 to 80 percent slopes
ROF	Rock outcrop-Orthids complex, 40 to 80 percent slopes
RUF	Rock outcrop-Ustolls complex, 15 to 70 percent slopes
SAF	Salas complex, 20 to 80 percent slopes
SBE	Sandia-Kolob complex, 15 to 40 percent slopes
SC	Scholle-Ildefonso association
SEC	Seis very cobbly loam, 0 to 15 percent slopes
SFE	Seis stony loam, 15 to 60 percent slopes
SGE	Seis-Silver complex, 10 to 40 percent slopes
SHF	Seis complex, 30 to 80 percent slopes
SkE	Shingle-Badland complex, eroded, 2 to 40 percent slopes
SL	Shingle, eroded-Kim association
SmA	Silver fine sandy loam, 0 to 2 percent slopes
SnA	Silver fine sandy loam, moderately alkali, 0 to 2 percent slopes
SwB	Silver and Witt soils, 2 to 5 percent slopes
SwC	Silver and Witt soils, 5 to 9 percent slopes
Te	Tesajo-Millett stony sandy loams
TgB	Tijeras gravelly fine sandy loam, 1 to 5 percent slopes
To	Tome very fine sandy loam
TP	Torrifluvents, frequently flooded
TQC	Travessilla fine sandy loam, 1 to 15 percent slopes
TR	Travessilla-Rock outcrop association
Va	Vinton loamy sand
VbA	Vinton sandy loam, 0 to 1 percent slopes
VBB	Vinton sandy loam, 1 to 3 percent slopes
Vc	Vinton clay loam
VF	Vinton and Brazito soils, occasionally flooded
WaB	Wink fine sandy loam, 0 to 5 percent slopes
WeB	Wink-Embudo complex, 0 to 5 percent slopes
WM	Wink-Madurez association

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO
CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

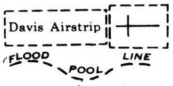
CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool



STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate
- Federal
- State
- County, farm or ranch

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

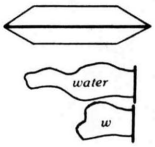
FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small

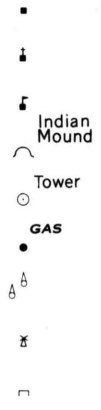


PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

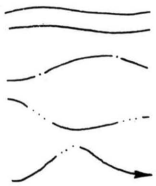
- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label)
- Located object (label)
- Tank (label)
- Wells, oil or gas
- Windmill
- Kitchen midden



WATER FEATURES

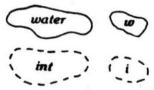
DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label)
  - Drainage and/or irrigation



LAKES, PONDS AND RESERVOIRS

- Perennial
- Intermittent



MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 1

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 1

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

415 000 FEET

R. 4 E. R. 5 E.

EtC TgB SC Te ILC Ba SHF SAF ROF SFE

LIMIT OF SOIL SURVEY

SANDIA PUEBLO

CIBOLA NATIONAL FOREST

T. 12 N.

1 555 000 FEET

(Joins sheet 2)

(Joins sheet 3)

440 000 FEET

N

2 Miles 10000 Feet

Scale 1:24000

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 2

(2)

N

R. 5 E.

470 000 FEET

1 570 000 FEET

T. 12 N.

2 Miles

10000 Feet

5000

1

Scale 1:24000

(Joins sheet 1)

LIMIT OF SOIL SURVEY

SHF

SHF

SC

ILC

Te

SC

ROF

SFE

ROF

SC

44

SFE

CIBOLA

NATIONAL

FOREST

Ba

Canyon

Tejano

Te

Ba

ROF

SHF

SEC

ROF

ROF

SFE

ROF

SFE

SFE

SC

SFE

Ba

ILC

ILC

SFE

1 555 000 FEET

445 000 FEET

(Joins sheet 4)

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 2

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 3

R. 4 E. | R. 5 E.

(Joins sheet 1)

415 000 FEET

1 555 000 FEET

T. 12 N.

SANDIA PUEBLO

CIBOLA NATIONAL FOREST

SANDIA MOUNTAINS

Sandia Peak

LIMIT OF SOIL SURVEY

Te SAF ROF BOF KS KU SFE KVE KT SBE Ra

(Joins sheet 4)

(Joins sheet 12)

440 000 FEET

1 535 000 FEET

3

N

2 Miles

10000 Feet

Scale 1:24000

1 5000 0 1000 2000 3000 4000 5000

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 3

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 4

(4)

N

2 Miles

10000 Feet

Scale 1:24000

1 5000

(Joins sheet 2)

R. 5 E.

470 000 FEET

T. 12 N.

1 550 000 FEET

(Joins sheet 3)

1 535 000 FEET

445 000 FEET

(Joins sheet 13)

CIBOLA NATIONAL FOREST

Huertas Creek

Las

Palomas Peak

SOIL SURVEY OF LIMIT

ROF SFE SHF ILC Ba BKO SEC SC (44) (S) KU Ra KS SBE BOF KT

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 4

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 5

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 5

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

205 000 FEET (CENTRAL ZONE)

R. 3 W.

705 000 FEET (WEST ZONE)

(Joins inset A, sheet 5)

1 535 000 FEET (CENTRAL ZONE)

1 535 000 FEET (WEST ZONE)

SANDOVAL COUNTY

BERNALILLO COUNTY

BERNALILLO

VALENCIA

COUNTY

CAÑONCITO NAVAJO INDIAN RESERVATION

TR PG TQC PEB GH

R. 3 W.

230 000 FEET (CENTRAL ZONE)

710 000 FEET (WEST ZONE)

1 545 000 FEET (WEST ZONE)

1 545 000 FEET (CENTRAL ZONE)

1 540 000 FEET (WEST ZONE)

1 540 000 FEET (CENTRAL ZONE)

1 520 000 FEET (WEST ZONE)

LIMIT OF SOIL SURVEY

CAÑONCITO NAVAJO INDIAN RESERVATION

HERRERA MESA

CAÑADA DE LOS ALAMOS GRANT

Canada de los Apaches

Ra SL PFB

700 000 FEET (WEST ZONE)

(Joins upper right)

235 000 FEET (CENTRAL ZONE)

INSET A

680 000 FEET (WEST ZONE)

230 000 FEET (CENTRAL ZONE)

(Joins sheet 15)

T. 11 N.

1 520 000 FEET (CENTRAL ZONE)

(Joins sheet 6)

5

N

2 Miles

10 000 Feet

1

5 000

Scale 1:24000

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 6

6

N

710 000 FEET (WEST ZONE)

260 000 FEET (CENTRAL ZONE)

1 535 000 FEET (WEST ZONE)

1 535 000 FEET (CENTRAL ZONE)

SANDOVAL COUNTY

BERNALILLO COUNTY

CAÑADA DE LOS ALAMOS GRANT

Cañada del Ojo

Herrera

CAÑONCITO NAVAJO INDIAN RESERVATION

La Mesita Blanca

(Joins sheet 5)

(Joins sheet 7)

(Joins sheet 16)

520 000 FEET (CENTRAL ZONE)

520 000 FEET (WEST ZONE)

235 000 FEET (CENTRAL ZONE)

735 000 FEET (WEST ZONE)

T. 11 N.

R. 3 W. R. 2 W.

2 Miles

10000 Feet

Scale 1:24000

5000

0

1000

2000

3000

4000

5000

TR PG SL GH PEB PFB TQC Ra Ba Ha KbB KD OT BCC

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 6

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 7

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 7

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

265 000 FEET

1 535 000 FEET

SANDOVAL COUNTY
BERNALILLO COUNTY

LAGUNA INDIAN RESERVATION

(BERNARDO M MONTANO GRANT)

CAÑONCITO NAVAJO INDIAN RESERVATION

US Weather Bureau Rain Gauges

RIO PUERCO

(Joins sheet 6)

(Joins sheet 8)

(Joins sheet 17)

1 520 000 FEET

290 000 FEET

T. 11 N.

R. 2 W. | R. 1 W.

7

N

2 Miles

10000 Feet

Scale 1:24000

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 8

8

N

Scale 1:24000

2 Miles 10000 Feet

1 5000

320 000 FEET

535 000 FEET

SANDOVAL COUNTY

BERNALILLO COUNTY

TOWN OF ALAMEDA

GRANT

State Game and Fish Commission Bird Shelter

State Game and Fish Commission Shelter

(Joins sheet 7)

(Joins sheet 9)

(Joins sheet 18)

T. 11 N.

1 520 000 FEET

295 000 FEET

R 1 W R 1 E

BKD BCC GH Ha Bb PAC MaB MWA LtB

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 8

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 9

9

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 9

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

325 000 FEET

1 535 000 FEET

SANDOVAL COUNTY
BERNALILLO COUNTY

TOWN OF ALAMEDA

GRANT

Black Ranch

T. 11 N.

1 520 000 FEET

R. 1 E. | R. 2 E.

350 000 FEET

(Joins sheet 8)

(Joins sheet 10)

(Joins sheet 19)

BKD
BCC
MaB
PAC
LtB
MWA
WaB
AmB
AkC
RBE
KR

N

Scale 1:24000

2 Miles 1 0

10000 Feet 5000 0

1 000 2000 3000 4000 5000

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 10

10

N

Scale 1:24000

2 Miles 1 0

10000 Feet 5000 0

1 ½ 0

1 ¾ ½ ¼ 0

5000 4000 3000 2000 1000 0

380 000 FEET

1 535 000 FEET

1 520 000 FEET

355 000 FEET

SANDOVAL COUNTY
BERNALILLO COUNTY

TOWN OF ALAMEDA GRANT

Arroyo de las Calabacillas

Alameda Airport

RIO GRANDE DRAIN

RIVERSIDE DRAIN

CORRALES RD

COORS RD

RIVERSIDE DR

ALBUQUERQUE

EL PUEBLO RD

RIO GRANDE BLVD

(Joins sheet 9)

(Joins sheet 11)

(Joins sheet 20)

R. 2 E. | R. 3 E.

T. 11 N.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 10

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 11

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

385 000 FEET

1 535 000 FEET

SANDOVAL COUNTY
BERNALILLO COUNTY

RIO GRANDE

TOWN OF ALAMEDA GRANT

SANDIA PUEBLO

ELENA GALLEGOS GRANT

Coronado Airport

Ranchos de Albuquerque School

Reeves Powerplant

Jaral Canyon

Arroyo de Domingo Baca

CORRALES RD
RIVERSIDE DRAIN
UPPER CORRALES RIVERSIDE DRAIN
ALBUQUERQUE RIVERSIDE CANAL
4TH ST
ALAMEDA RD
2ND ST
MAIN
SANTA FE LATERAL
ATCHISON TOPEKA & SANTA FE
EDITH BLVD
TRAMWAY RD
LOS ANGELES AVE
WYOMING BLVD
EL PUEBLO RD
RIO GRANDE BLVD

(Joins sheet 10)

(Joins sheet 12)

(Joins sheet 21)

410 000 FEET

1 520 000 FEET

T. 11 N.

R. 3 E. | R. 4 E.

11

N

2 Miles
10000 Feet
5000

Scale 1:24000

1 0 1 0
¼ ¼ ¼ ¼
1000 2000 3000 4000 5000

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 12

12

N

2 Miles

10000 Feet

1

5000

Scale 1:24000

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

(Joins sheet 3)

(Joins sheet 11)

(Joins sheet 22)

(Joins sheet 13)

440 000 FEET

415 000 FEET

1 530 000 FEET

1 520 000 FEET

T. 11 N.

R. 4 E. | R. 5 E.

SANDOVAL COUNTY

BERNALILLO COUNTY

SANDIA PUEBLO

CIBOLA NATIONAL FOREST

ELENA GALLEGOS GRANT

Sandia Crest

TRAMWAY RD

Cañon de Domingo Baca

556

536

TgB EtC EmB Te ROF SAF BOF Ra KVE KT

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 12

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 13

13

445 000 FEET

1 530 000 FEET

1 515 000 FEET

470 000 FEET

N

T. 11 N.

R. 5 E. R. 6 E.

(Joins sheet 4)

(Joins sheet 12)

(Joins sheet 14)

(Joins sheet 23)

SANDOVAL COUNTY

BERNALILLO COUNTY

SOIL SURVEY LIMIT OF COUNTY

SANDIA MOUNTAINS

CIBOLA NATIONAL FOREST

SAN PEDRO GRANT

ELENA GALLEGOS GRANT

Madera Canyon

Tecolote Canyon

Tejano Canyon

Barro Canyon

Pino Canyon

Sandia Park

San Antonito

KT KU KVE SBE BOF SFE SHF ROF SwC LBE RCE LRD CAF BUE KS Ra Mz La

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

2 Miles 1 0 10000 Feet 5000

Scale 1:24000

1 0 5000 4000 3000 2000 1000 0

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 13

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 14

14

N

R. 6 E.

500 000 FEET

T. 11 N.

1 530 000 FEET

2 Miles

10000 Feet

Scale 1:24000

1 inch = 5000 feet

1 centimeter = 1000 meters

(Joins sheet 13)

SANDOVAL COUNTY

BERNALILLO COUNTY

SAN PEDRO

GRANT COUNTY

VALENCIA COUNTY

LARGO

MONTE

Creek

Pedro

San

Arroyo

Arroyo

SwC

SwB

LRD

RCE

RUF

SC

La

Mz

ROF

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 14

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 515 000 FEET

475 000 FEET

(Joins sheet 24)

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 15

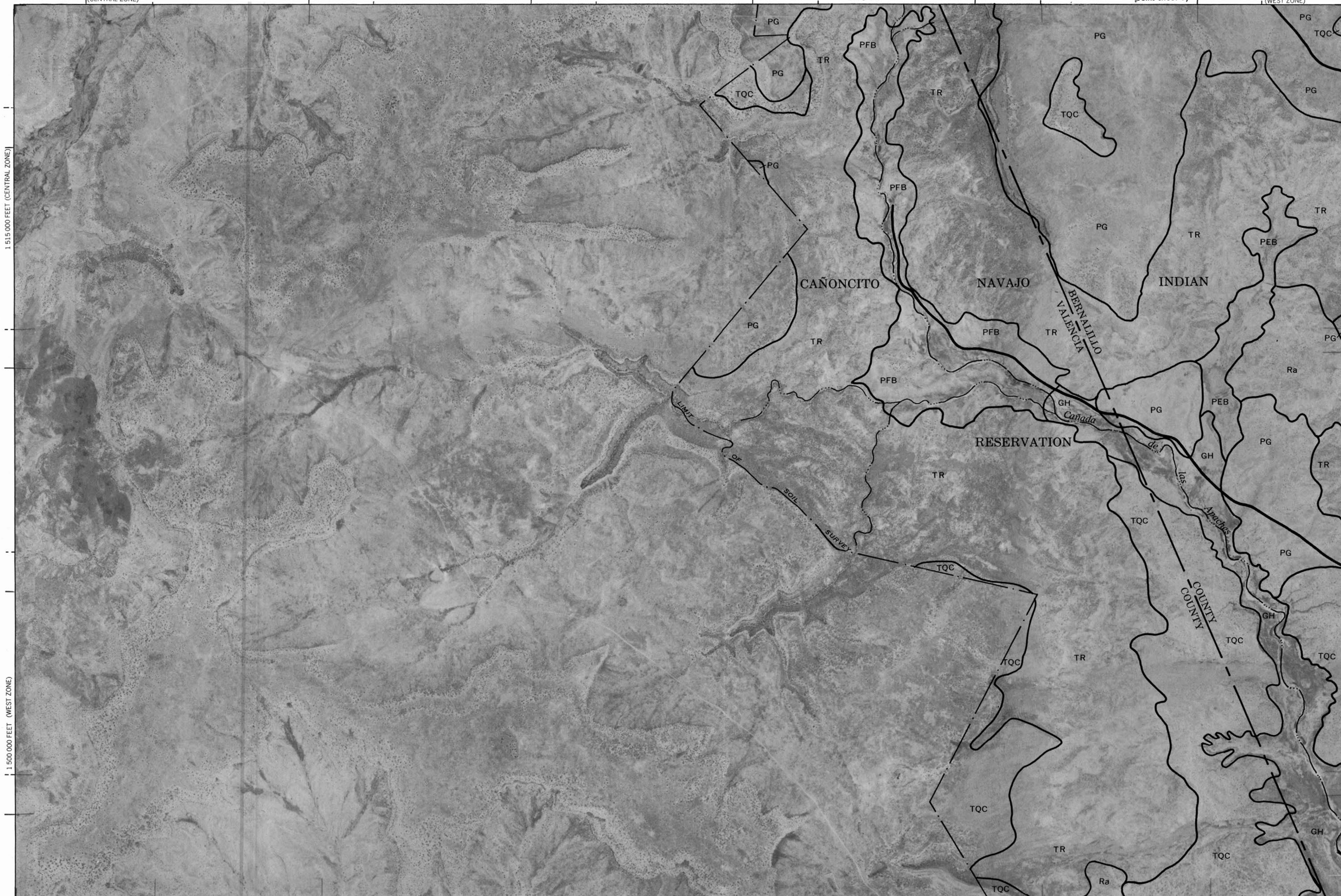
(15)

205 000 FEET (CENTRAL ZONE)

R. 3 W.

(Joins sheet 5)

705 000 FEET (WEST ZONE)



1 515 000 FEET (CENTRAL ZONE)

1 500 000 FEET (WEST ZONE)

680 000 FEET (WEST ZONE)

230 000 FEET (CENTRAL ZONE)

(Joins sheet 25)

1 515 000 FEET (WEST ZONE)

(Joins sheet 16)

T. 11 N.

T. 10 N.

1 500 000 FEET (CENTRAL ZONE)

N

2 Miles — 1 — ¾ — ½ — ¼ — 0

10000 Feet — 5000 — 4000 — 3000 — 2000 — 1000 — 0

Scale 1:24000

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 15

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

16

N

(Joins sheet 6)

710 000 FEET (WEST ZONE)

260 000 FEET (CENTRAL ZONE)

1 515 000 FEET (WEST ZONE)

1 515 000 FEET (CENTRAL ZONE)

2 Miles

10000 Feet

Scale 1:24000

1 5000

(Joins sheet 15)

CAÑONCITO NAVAJO INDIAN RESERVATION

La Mesa Ouebrada

Canada del Ojo

PG TQC Ra GH PFB SL TR PEB OT KD SnA SmA PFB Bd3 BCC KOE

(Joins sheet 17)

T. 10 N. | T. 11 N.

1 500 000 FEET (CENTRAL ZONE)

1 500 000 FEET (WEST ZONE)

235 000 FEET (CENTRAL ZONE)

(Joins sheet 26)

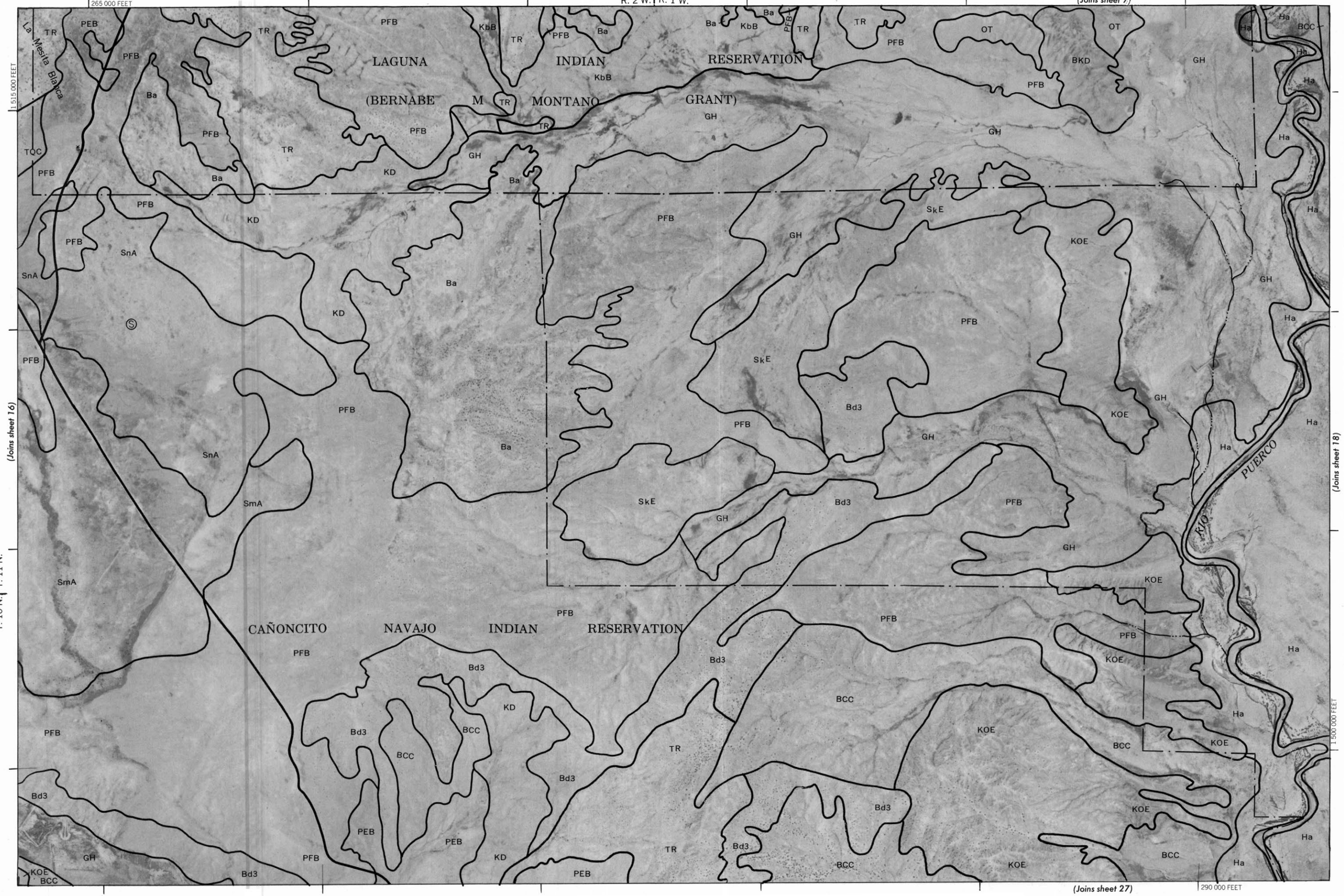
R. 3 W. | R. 2 W.

735 000 FEET (WEST ZONE)

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 16

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 17



17

N

2 Miles

10000 Feet

Scale 1:24000

1 5000 0 1 000 2000 3000 4000 5000

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 18

18

N

Scale 1:24000

2 Miles 10000 Feet

1 5000

0 0

¼ 1000

½ 2000

¾ 3000

1 4000

5000

(Joins sheet 8)

R. 1 W. | R. 1 E.

320 000 FEET

1 515 000 FEET

T. 10 N. | T. 11 N.

1 500 000 FEET

295 000 FEET

(Joins sheet 17)

(Joins sheet 19)

(Joins sheet 28)

Rio Puerco Ranch

Benavidez Ranch

TOWN OF ATRISCO GRANT

BCC BKD Ha PAC MWA MaB LtB To WaB Bb

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 18

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 19

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 19

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

325 000 FEET

1 515 000 FEET

R. 1 E. | R. 2 E.

T. 10 N. | T. 11 N.

1 500 000 FEET

350 000 FEET

(Joins sheet 18)

(Joins sheet 9)

(Joins sheet 20)

(Joins sheet 29)

TOWN OF ATRISCO GRANT

VOLCANOES

THE

MaB MWA LtB To WaB AkC AmB RBE KR BKD BCC

19

N

2 Miles 1

10000 Feet 5000

Scale 1:24000

0 ¼ ½ ¾ 1 1000 2000 3000 4000 5000

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 20

20

N

Scale 1:24000

2 Miles 1 0 10000 Feet 5000 0

1 5000 ¼ 4000 ½ 3000 ¾ 2000 1 1000 0

T. 10 N. | T. 11 N.

R. 2 E. | R. 3 E.

380 000 FEET

1 515 000 FEET

1 500 000 FEET

355 000 FEET

(Joins sheet 10)

(Joins sheet 19)

(Joins sheet 21)

(Joins sheet 30)

MWA AkC KR BKD LtB AmB BCC PAC To VF TP An Gk Bs Ao Gb Ge Af Ag Br Gm Gd Bt Va

ATRISCO RD

COORS RD

CORRALES DRAIN

RIVERSIDE DRAIN

RIO GRANDE

ALBUQUERQUE MAIN CANAL

RIO GRANDE BLVD

GRIEGOS LATERAL

GALLEGOS LATERAL

DURANES DRAIN

GRIEGOS DRAIN

MONTANO RD

ALAMEDA DRAIN

CANDELARIA RD

4TH ST

2ND ST

ELENA GALLEGOS

GRANT

TOWN OF ATRISCO

TOWN OF ALBUQUERQUE

UNIVERSITY OF ALBUQUERQUE

Wm Taft Jr High School

Alvarado School

Douglas MacArthur School

Griegos School

Trinity School

Valley High School

Garfield Jr High School

St Therese Church

US Indian School

448 449 194 85

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 20

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 21

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 21

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

385 000 FEET

1 515 000 FEET

R. 3 E. | R. 4 E.

(Joins sheet 11)

(Joins sheet 20)

(Joins sheet 22)

(Joins sheet 31)

410 000 FEET

1 500 000 FEET

10 N.|T. 11 N.

21

N

2 Miles

1 0 1

10000 Feet

5000 0 5000

Scale 1:24000

ELENA

GALLEGOS

GRANT

ALBUQUERQUE
(county seat)

TOWN OF ALBUQUERQUE GRANT

Arroyo del Pino

Bear Arroyo

Pino Canyon

Bear Canyon

Albuquerque Academy

Academy for Boys

McKinley Jr High School

Carlisle Plaza Church

Bel-Air School

Montgomery School

Madison Jr High School

Yucca School

Sandia High School

Sombra del Monte School

Sombra del Monte Church

Hope Church

Queen of Heaven School

Zuni School

Saint Johns Church

La Luz School

WATER

OSUNA RD

MONTANO RD

MONTGOMERY BLVD

CANDELARIA RD

4TH ST

ALAMEDA DRAIN

2ND ST

ATCHISON TOPEKA AND SANTA FE

EDITH BLVD

SAN MATEO BLVD

LOUISIANA BLVD

WYOMING BLVD

Gb Ge Va VbA Gd Gm Gk BKD GF WeB EmB EtC TgB Cu Bt

22

N

(Joins sheet 12)

440 000 FEET

1 510 000 FEET

(Joins sheet 21)

(Joins sheet 23)

415 000 FEET

(Joins sheet 32)

2 Miles

10000 Feet

5000

Scale 1:24000

T. 10 N. | T. 11 N.

1 500 000 FEET

R. 4 E. | R. 4½ E. | R. 5 E.

ELENA

GALLEGOS

GRANT

CIBOLA NATIONAL FOREST

ALBUQUERQUE

(county seat)

Pino Canyon

Bear Canyon

Piedra Lisa Canyon

MONTGOMERY BLVD

EUBANK BLVD

TRAMWAY RD

CANDELARIA RD

Aztec School

WATER

EtC

TgB

EmB

Te

ROF

BOF

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 22

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 23

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 23

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

445 000 FEET

1 510 000 FEET

T. 11 N.

T. 10 N.

R. 5 E. | R. 6 E.

(Joins sheet 13)

(Joins sheet 22)

(Joins sheet 24)

(Joins sheet 33)

470 000 FEET

495 000 FEET

ELENA GALLEGOS GRANT

SANDIA MOUNTAINS

CIBOLA NATIONAL FOREST

CAÑON DE CARNUE GRANT

San Antonio

Cañoncito

Arroyo San Antonio

Forest Park

Cedar Crest

South Sandia Peak

BOF Ra KT KU CAF BUE La RCE SwB SwC Mz SFE ROF

23

N

2 Miles

10000 Feet

Scale 1:24000

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 25

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 25

205 000 FEET (CENTRAL ZONE)

705 000 FEET (WEST ZONE)

1 495 000 FEET (CENTRAL ZONE)

1 495 000 FEET (WEST ZONE)

1 480 000 FEET (WEST ZONE)

680 000 FEET (WEST ZONE)

230 000 FEET (CENTRAL ZONE)

1 480 000 FEET (CENTRAL ZONE)

R. 3 E.

T. 10 N.

(Joins sheet 15)

(Joins sheet 26)

(Joins sheet 35)

25

N

2 Miles

10000 Feet

5000

Scale 1:24000

0 1000 2000 3000 4000 5000

RESERVATION

INDIAN

NAVAJO

CAÑONCITO

Canyon

Sandoval

SOIL SURVEY OF LIMIT

MESA GIGANTE

(BELL ROCK MESA)

Cañada de los Alamos

TQC

PG

PEB

Ra

TR

GH

26

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 26

N

Scale 1:24000

2 Miles 1 0

10000 Feet 5000 0 1000 2000 3000 4000 5000

(Joins sheet 16)

710 000 FEET (WEST ZONE)

R. 3 W. R. 2 W.

260 000 FEET (CENTRAL ZONE)

1 495 000 FEET (WEST ZONE)

1 495 000 FEET (CENTRAL ZONE)

(Joins sheet 25)

(Joins sheet 27)

1 480 000 FEET (CENTRAL ZONE)

1 480 000 FEET (WEST ZONE)

(Joins sheet 36)

235 000 FEET (CENTRAL ZONE)

735 000 FEET (WEST ZONE)

T. 10 N.

Arroyo Salado

Cañada de las Apaches

Cañada de los Alamos

Cañoncito Navajo Day School

WATER

BERNALILLO

VALENCIA

COUNTY

COUNTY

CAÑONCITO NAVAJO INDIAN RESERVATION

TQC BCC GH OT SL PEB TR KD KOE PG Ra Ba SmA PFB Bd3

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXIGO NO. 27

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 27

27

N

265 000 FEET (CENTRAL ZONE)

765 000 FEET (WEST ZONE)

1 495 000 FEET (CENTRAL ZONE)

1 495 000 FEET (WEST ZONE)

1 480 000 FEET (WEST ZONE)

1 480 000 FEET (CENTRAL ZONE)

740 000 FEET (WEST ZONE)

290 000 FEET (CENTRAL ZONE)

(Joins sheet 17)

(Joins sheet 26)

(Joins sheet 28)

(Joins sheet 37)

T. 10 N.

R. 2 W. | R. 1 W.

CAÑONCITO NAVAJO INDIAN RESERVATION

PUERCO

GRANT

RIO ATRISCO

OF

TOWN

Cañada del Ojo

BCC Bd3 GH Ha KD KOE PEB PFB TR

2 Miles

10000 Feet

Scale 1:24000

1 5000 0

¼ 1000 0

½ 2000

¾ 3000

1 4000

¾ 5000

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 28

28

N

(Joins sheet 18)

320 000 FEET

1 495 000 FEET

(Joins sheet 27)

(Joins sheet 29)

T. 10 N.

1 480 000 FEET

295 000 FEET

(Joins sheet 38)

R. 1 W. | R. 1 E.

TOWN OF ATRISCO GRANT

El Rincon

Ha BKD BCC Bb PAC LtB MWA WaB To MaB

2 Miles

10000 Feet

Scale 1:24000

1 0 ¼ ½ ¾ 1

5000 0 1000 2000 3000 4000 5000

This map is compiled on 1973 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 28

BERNALILLO COUNTY AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 29

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 29

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

325 000 FEET

1 495 000 FEET

(Joins sheet 28)

(Joins sheet 19)

(Joins sheet 30)

(Joins sheet 39)

350 000 FEET

1 480 000 FEET

R. 1 E. | R. 2 E.

T. 10 N.

TOWN OF ATRISCO GRANT

CENTRAL AVE

MWA WaB LtB MaB BKD BCC PAC KR AmB

40 66

29

N

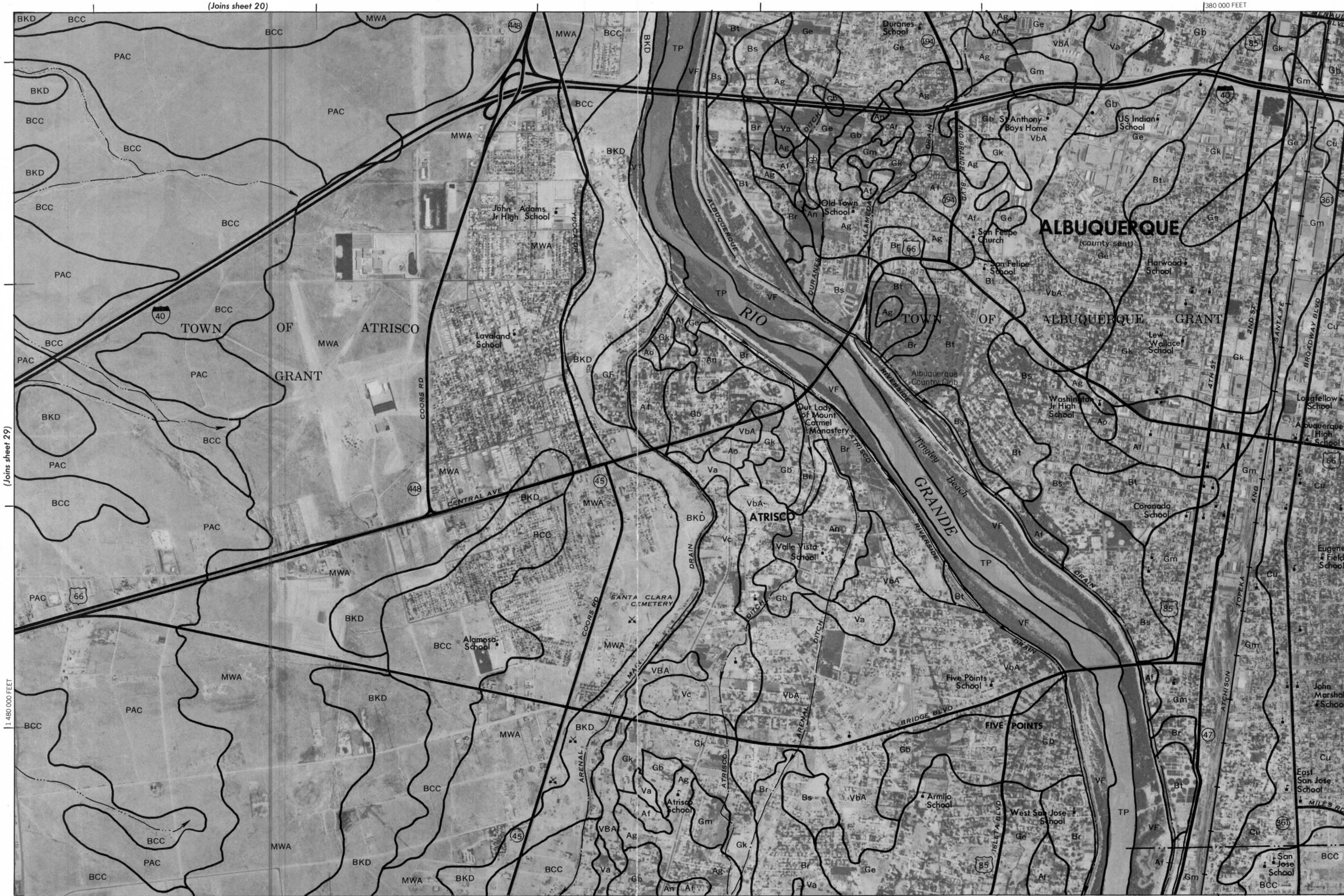
2 Miles

10000 Feet

Scale 1:24000

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 30

(Joins sheet 20)



N

Scale 1:24000

1 0 1 2 Miles

5000 0 5000 10000 Feet

1 0 1 2 3 4 5 Kilometers

(Joins sheet 29)

(Joins sheet 31)

(Joins sheet 40)

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 30

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 31

R. 3 E. R. 4 E.

385 000 FEET

1 495 000 FEET

(Joins sheet 21)

(Joins sheet 30)

(Joins sheet 32)

(Joins sheet 41)

1 480 000 FEET

410 000 FEET

T. 10 N.

31

N

Scale 1:24000

2 Miles 1 0 1

10000 Feet 5000 0 5000

1 000 2000 3000 4000 5000

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 31

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

Menaul School
Queen of Heaven Church
Cortez School
Reformed Church
Pius X High School
Monroe Jr High School
Inez School
Montezuma School
Neighborhood Church
Mark Twain School
Temple Church
Santa Barbara School
San Ignacio School
US Indian Hospital
Jefferson Jr High School
Heights Church
Zia School
Saint Marks Church
First Church
Monte Vista School
St Timothys Church
Saint Timothys Church
Immanuel Church
Trinity Church
Eugene Field School
Lincoln Jr High School
Bandelier School
Highland High School
Highland Church
Redeemer Church
Emerson School
Mary Francis School
East Mesa Church
Holy Ghost School
Wilson Jr High School
Wherry School
Los Altos Church
Animal Shelter
Los Altos Park
Army Reserve Training Center
La Mesa School
Lowell School
Fairground
State
ALBUQUERQUE
(county seat)
TOWN OF ALBUQUERQUE
UNIVERSITY OF NEW MEXICO
GRANT
SANDIA MILITARY RESERVATION
KIRTLAND AIR FORCE BASE
MOUNT CALVARY CEMETERY
FAIRVIEW CEMETERY
SUNSET MEMORIAL PARK
MENAUL BLVD
BROADWAY BLVD
LOUISIANA BLVD
WYOMING BLVD
CENTRAL AVE
GIBSON BLVD
SAN MATEO BLVD
PENNSYLVANIA AVE
GRACE AVE
MILES RD
LOMAS BLVD
Embudo del Arroyo

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 32

32

N

Scale 1:24000

2 Miles 10000 Feet

1 5000

(Joins sheet 22)

(Joins sheet 31)

T. 10 N.

1 480 000 FEET

415 000 FEET

(Joins sheet 42)

440 000 FEET

1 490 000 FEET

(Joins sheet 33)

R. 4 E. R. 4½ E. R. 5 E.

MENAUL BLVD

LOMAS BLVD

CENTRAL AVE

EUBANK BLVD

TRAMWAY RD

SANDIA MILITARY RES.

ALBUQUERQUE
(county seat)

Eubank School

Jackson Jr High School

Acoma School

Las Altos School

Embudo Canyon

CIBOLA NATIONAL FOREST

Four Hills Ranch

Tijeras Canyon

Santo Nino Church

Carnue

EtC TgB EMB Te ROF BOF BKD GA MWA SAF

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO No. 32

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 33

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 33

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

33

N

445 000 FEET

1 490 000 FEET

(Joins sheet 23)

(Joins sheet 32)

(Joins sheet 34)

(Joins sheet 43)

1 475 000 FEET

470 000 FEET

R. 5 E. | R. 6 E.

T. 10 N.

Cedar Crest

San Antonio

Casa Loma

Zamora

Tijeras

CIBOLA NATIONAL FOREST

SANDIA MOUNTAINS

Hondo Canyon

Primera Canyon

Agua Canyon

Chamisoso Canyon

Corrol Canyon

Apachitos Canyon

Cedro Canyon

2 Miles

10 000 Feet

Scale 1:24000

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 34

34

N

(Joins sheet 24)

500 000 FEET

1 490 000 FEET

T. 10 N.

(Joins sheet 33)

475 000 FEET

(Joins sheet 44)

R. 6 E. | R. 7 E.

2 Miles

10000 Feet

Scale 1:24000

1 5000 0 0 ¼ 1000 ½ 2000 ¾ 3000 1 4000 5000

Tijeras Canyon

Comers

Sedillo

Canyon

Barton

Sedillo

CIBOLA NATIONAL FOREST

Tablazon Canyon

COUNTY

COUNTY

BERNALILLO

SANTA FE

RCE Mz La LRD SwC SHF SGE ROF SwB

40 66 44 217

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 34

BERNALILLO COUNTY, AND PARTS OF SANDOVAL. AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 35

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 35

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

205 000 FEET (CENTRAL ZONE)

705 000 FEET (WEST ZONE)

1 475 000 FEET (CENTRAL ZONE)

1 475 000 FEET (WEST ZONE)

1 460 000 FEET (WEST ZONE)

1 460 000 FEET (CENTRAL ZONE)

680 000 FEET (WEST ZONE)

230 000 FEET (CENTRAL ZONE)

(Joins sheet 25)

(Joins sheet 36)

MESA GIGANTE

(BELL ROCK MESA)

CAÑONCITO NAVAJO INDIAN RESERVATION

SOIL SURVEY OF LIMIT

Cañada de los Alamos

PG

TR

TQC

S

R. 3 W.

T. 9 N. | T. 10 N.

35

N

2 Miles

10000 Feet

1

5000

Scale 1:24000

0 1000 2000 3000 4000 5000

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 36

36

N

(Joins sheet 26)

710 000 FEET (WEST ZONE)

260 000 FEET (CENTRAL ZONE)

1 475 000 FEET (WEST ZONE)

1 475 000 FEET (CENTRAL ZONE)

Cañada de los Alamos

Cañada de los Apaches

CAÑONCITO NAVAJO INDIAN RESERVATION

LIMIT OF SOIL SURVEY

BERNALILLO VALENCIA COUNTY COUNTY

T. 10 N.

T. 9 N.

(Joins sheet 35)

(Joins sheet 37)

Herrera Ranch

LAGUNA (ANTONIO SEDILLO INDIAN GRANT) RESERVATION

TQC PEB PFB PG TR KD SKE GH MbC SmA OT Ba SL KOE KaB BCC Ra

40 66

Scale 1:24000

2 Miles 10000 Feet

1 5000

¼ 1000

½ 2000

¾ 4000

0 0

1 460 000 FEET (CENTRAL ZONE)

1 460 000 FEET (WEST ZONE)

235 000 FEET (CENTRAL ZONE)

(Joins sheet 45)

R. 3 W. | R. 2 W.

735 000 FEET (WEST ZONE)

This map is compiled on 1972 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO. & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 36

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 37

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 37

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

265 000 FEET (CENTRAL ZONE)

765 000 FEET (WEST ZONE)

1 475 000 FEET (CENTRAL ZONE)

1 475 000 FEET (WEST ZONE)

1 460 000 FEET (WEST ZONE)

1 460 000 FEET (CENTRAL ZONE)

1 740 000 FEET (WEST ZONE)

290 000 FEET (CENTRAL ZONE)

(Joins sheet 27)

(Joins sheet 36)

(Joins sheet 38)

(Joins sheet 46)

CAÑONCITO NAVAJO INDIAN RESERVATION

TOWN OF ATRISCO GRANT

LAGUNA INDIAN RESERVATION

(ANTONIO SEDILLO GRANT)

Cañada de las Apaches

Cañada del Oso

RIO PUERCO

R. 2 W. | R. 1 W.

T. 9 N. | T. 10 N.

37

N

Scale 1:24000

2 Miles

10000 Feet

5000

1

0

1000

2000

3000

4000

5000

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 38

38

N

(Joins sheet 28)

320 000 FEET

1 475 000 FEET

T. 9 N. | T. 10 N.

R. 1 W. | R. 1 E.

2 Miles

10000 Feet

Scale 1:24000

1 0 1

¼ 0 ¼

½ 1000 ½

¾ 2000 ¾

1 3000 1

5000 4000 5000

1 460 000 FEET

(Joins sheet 37)

295 000 FEET (Joins sheet 47)

(Joins sheet 39)

TOWN OF ATRISCO GRANT

PAJARITO GRANT

LAGUNA INDIAN RESERVATION

(ANTONIO SEDILLO GRANT)

RIO PUERCO

Cerro Colorado

La Mesita Negra

BCC BKD Ha RBE KR GH PAC MaB LtB WaB MWA Bb

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 38

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 39

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 39

39

N

325 000 FEET

1 475 000 FEET

(Joins sheet 29)

(Joins sheet 38)

(Joins sheet 40)

(Joins sheet 48)

350 000 FEET

1 460 000 FEET

T. 9 N. | T. 10 N.

R. 1 E. | R. 2 E.

TOWN OF ATRISCO GRANT

PAJARITO GRANT

MaB MWA WaB BKD BCC PAC LtB

Scale 1:24 000

2 Miles

10000 Feet

5000

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 40

(40)

N

Scale 1:24000

2 Miles 10000 Feet

1 5000

¼ ½ 0 0 ¼ ½ 1000 2000 ¾ 1 3000 4000 ¾ 1 5000

T. 9 N. | T. 10 N.

(Joins sheet 30)

380 000 FEET

1 475 000 FEET

(Joins sheet 39)

1 460 000 FEET

355 000 FEET (Joins sheet 49)

(Joins sheet 41)

R. 2 E. | R. 3 E.

TOWN OF ATRISCO GRANT

PAJARITO GRANT

ALBUQUERQUE

ARMIJO

Arenal

SAN JOSE CEMETERY

St Anne School

Rio Grande High School

Ernie Pyle Jr High School

Kit Carson School

Immanuel Church

Barcelona School

Lourdes High School

Kinney

Mountainview School

COORS BLVD MAIN CANAL

ARENAL MAIN CANAL

ISLETA MAIN CANAL

ISLETA BLVD

ATRISCO

PALARIO

LATERAL

LOS PADILLAS

CLUB

GRANDE

RIO BRAVO BLVD

RIVERSIDE DRAIN

ALBUQUERQUE

2ND ST

SAN JOSE

SANTA FE

TOPEKA

ATCHISON

AND

BROADWAY BLVD

Tijeras Arroyo

BCC MWA BKD PAC TP VF GF GA BcA

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 40

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 41

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown are approximately positioned.

385 000 FEET

1 475 000 FEET

(Joins sheet 31)

(Joins sheet 40)

(Joins sheet 42)

(Joins sheet 50)

1 460 000 FEET

410 000 FEET

ALBUQUERQUE INTERNATIONAL AIRPORT

KIRTLAND AIR FORCE BASE

SANDIA MILITARY RESERVATION

KIRTLAND RD

GRANDE AVE

LOUISIANA BLVD

PENNSYLVANIA AVE

WYOMING BLVD

RIO BRAVO BLVD

SANTA FE

AND

TOPEKA

ATCHISON

Tijeras Arroyo

Arroyo del Coyote

BCC BKD Cu GA LtB MaB MWA TgB To WaB WeB EMB

T. 9 N. | T. 10 N.

R. 3 E. | R. 4 E.

41

N

2 Miles

10000 Feet

Scale 1:24000

42

N

(Joins sheet 32)

ALBUQUERQUE

CIBOLA NATIONAL FOREST

SANDIA MILITARY RESERVATION

Canyon

Tijeras

Arroyo del

Coyote

Arroyo del

T. 9 N.

T. 10 N.

1 475 000 FEET

1 460 000 FEET

415 000 FEET

(Joins sheet 41)

(Joins sheet 43)

(Joins sheet 51)

R. 4 E.

R. 4½ E.

R. 5 E.

2 Miles

10000 Feet

Scale 1:24000

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 42

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 43

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 43

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

445 000 FEET

(Joins sheet 33)

1 475 000 FEET

(Joins sheet 42)

(Joins sheet 44)

1 455 000 FEET

(Joins sheet 52)

470 000 FEET

R. 5 E. | R. 6 E.

T. 9 N. | T. 10 N.

43

N

Scale 1:24000

2 Miles

10000 Feet

5000

0

1000

2000

3000

4000

5000

CIBOLA NATIONAL FOREST

MANZANO MOUNTAINS

SANDIA MILITARY RESERVATION

Canyon

Corral Canyon

Apachitos Canyon

Cedro Canyon

Sabino Canyon

Otero Canyon

Madera Canyon

Lurance Canyon

Sol Mate Canyon

Cedro

SwC

SAF

ROF

SFE

SHF

SEC

SGE

Te

14

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 44

(44)

N

(Joins sheet 34)

R. 6 E.

500 000 FEET

T. 9 N. | T. 10 N.

10000 Feet

Scale 1:24000

5000 0 1000 2000 3000 4000 5000

(Joins sheet 43)

1 470 000 FEET

1 455 000 FEET

475 000 FEET

(Joins sheet 53)

CIBOLA NATIONAL FOREST

Juan Thomas Canyon

Cedro Canyon

Thomas Canyon

SANTA FE COUNTY

BERNALILLO COUNTY

TORRANCE COUNTY

SHF SwC SGE ROF LRD

(14) (217)

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 44

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 45

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

235 000 FEET (CENTRAL ZONE)

735 000 FEET (WEST ZONE)

(Joins sheet 36)

1 455 000 FEET (CENTRAL ZONE)

1 455 000 FEET (WEST ZONE)

1 435 000 FEET (CENTRAL ZONE)

1 435 000 FEET (WEST ZONE)

1 425 000 FEET (WEST ZONE)

1 425 000 FEET (CENTRAL ZONE)

1 440 000 FEET (WEST ZONE)

1 440 000 FEET (CENTRAL ZONE)

710 000 FEET (WEST ZONE)

260 000 FEET (CENTRAL ZONE)

(Joins sheet 46)

(Joins inset)

255 000 FEET (CENTRAL ZONE)

(Joins lower right)

735 000 FEET (WEST ZONE)

(Joins sheet 54)

730 000 FEET (WEST ZONE)

260 000 FEET (CENTRAL ZONE)

INSET B

T. 8 N.

T. 9 N.

R. 2 W.

LAGUNA INDIAN RESERVATION

(ANTONIO SEDILLO GRANT)

BERNALILLO

VALENCIA

COUNTY

COUNTY

40

66

PFB

TQC

PEB

KbB

KaB

Ba

Ra

TR

Ha

45

N

2 Miles

10000 Feet

5000

1

Scale 1:24000

0 1000 2000 3000 4000 5000

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 46

46

N

(Joins sheet 37)

290 000 FEET

1 455 000 FEET

2 Miles

10000 Feet

Scale 1:24000

1 5000

(Joins sheet 45)

PFB PEB KaB TQC TR KOE PbB Ha VBB PAC Ba KbB PbE To

LAGUNA INDIAN RESERVATION

(ANTONIO SEDILLO GRANT)

PUERCO RIO

ISLETA PUEBLO INDIAN LAND BCC

1 440 000 FEET

265 000 FEET (Joins sheet 54)

(Joins sheet 47)

T. 8 N. | T. 9 N.

R. 2 W. | R. 1 W.

1 ¾ ½ ¼ 0 0 ¼ ½ ¾ 1

5000 4000 3000 2000 1000 0 1000 2000 3000 4000 5000

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 46

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 47

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 47

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

47

N

2 Miles
10000 Feet

Scale 1:24000

295 000 FEET

1 455 000 FEET

1 440 000 FEET

320 000 FEET

(Joins sheet 38)

(Joins sheet 46)

(Joins sheet 48)

(Joins sheet 55)

T. 9 N.

T. 8 N.

R. 1 W.

R. 1 E.

LAGUNA INDIAN RESERVATION

(ANTONIO SEDILLO GRANT)

PAJARITO

GRANT

ISLETA PUEBLO INDIAN LAND

PUERCO

RIO

Ha
GH
BCC
BKD
Bb
WaB
MaB
PAC
PbB
WM
MWA

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 48

48

N

(Joins sheet 39)

350 000 FEET

1 455 000 FEET

(Joins sheet 47)

(Joins sheet 49)

1 440 000 FEET

T. 8 N. | T. 9 N.

325 000 FEET (Joins sheet 56)

R. 1 E. | R. 2 E.

PAJARITO GRANT

ISLETA PUEBLO INDIAN LAND

ISLETA PUEBLO GRANT

WaB MaB MWA BKD BCC LtB PAC PbB Bb RBE MWB

Scale 1:24000

2 Miles 10000 Feet 1 5000

0 1000 2000 3000 4000 5000

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 48

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 49

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 49

49

N

355 000 FEET

1 455 000 FEET

(Joins sheet 40)

(Joins sheet 48)

(Joins sheet 50)

(Joins sheet 57)

380 000 FEET

1 440 000 FEET

T. 9 N.

T. 8 N.

R. 2 E.

R. 3 E.

Pajarito

Los Padillas

Old Pajarito School

New Pajarito School

Mountainview

PAJARITO CEMETERY

LOS PADILLAS CEMETERY

PAJARITO

GRANT

ISLETA

PUEBLO

INDIAN LAND

RIO GRANDE

PAJARITO RD

REMUDA RD

BROADWAY BLVD

ISLETA BLVD

RIVERSIDE DRAIN

MAIN CANAL

ARENAL DRAIN

PUTMAN DRAIN

COORS RD

CLUB DRAIN

BARR CANAL

INTERIOR DRAIN

ATCHISON TOPEKA & SANTA FE

2ND ST

BCC

BKD

BcA

Bt

Va

VbA

Gb

Ge

Gm

Ag

Af

Ah

Ao

Br

Gk

Gd

Gs

Ar

Vc

An

Bs

GF

GA

TP

VF

KR

AmB

AkC

PbB

LtB

Scale 1:24000

2 Miles

10000 Feet

5000

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 50

50

N

Scale 1:24000

2 Miles 10000 Feet

1 5000 0 0 1/4 1000 1/2 2000 3/4 3000 1 4000 5000

(Joins sheet 41)

(Joins sheet 49)

410 000 FEET

1 455 000 FEET

1 440 000 FEET

385 000 FEET

(Joins sheet 58)

(Joins sheet 51)

SANDIA MILITARY RESERVATION

McCormick Ranch

ISLETA PUEBLO GRANT

BCC BKD LtB MaB MWA PAC TgB To WaB WM

R. 3 E. | R. 4 E.

T. 8 N. | T. 9 N.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 50

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 51

415 000 FEET

(Joins sheet 42)

1 455 000 FEET

(Joins sheet 50)

(Joins sheet 52)

1 435 000 FEET

440 000 FEET

R. 4 E.

R. 4½ E.

R. 5 E.

(Joins sheet 59)

T. 9 N.

T. 8 N.

SANDIA MILITARY RESERVATION

CIBOLA NATIONAL FOREST

ISLETA PUEBLO GRANT

MANZANO MOUNTAINS

Arroyo del Coyote

TgB MaB WaB LRD GA EMB ROF Te SAF To MWA LtB EtC ILC RUF NL

2 Miles 1 0

10000 Feet 5000 0

Scale 1:24000

1 ¼ ½ ¾ 1

1 000 2 000 3 000 4 000 5 000

51

N

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 51

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 52

52

N

Scale 1:24000

2 Miles 10000 Feet

1 5000 0 1 000 2 000 3 000 4 000 5000

(Joins sheet 43)

(Joins sheet 51)

1 435 000 FEET

445 000 FEET (Joins sheet 60)

470 000 FEET

1 450 000 FEET

(Joins sheet 53)

T. 9 N.

T. 8 N.

R. 5 E. R. 6 E.

CIBOLA NATIONAL FOREST

ISLETA TRACT

Sol se Mete Peak

Sol se Mete Canyon

Washington Mount

Bonito Canyon

David Canyon

SAF Te ROF SEC SHF SGE SwC LRD ILC PR RLF LBE RCE

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 52

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 53

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 53

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

475 000 FEET

1 450 000 FEET

(Joins sheet 52)

(Joins sheet 44)

CIBOLA NATIONAL FOREST

CIBOLA NATIONAL FOREST

ISLETA TRACT

Tranquillo Pine

Ponderosa Pine

Miera

Yrisarri

Arroyo de Yrisarri

Carolino Canyon

MANZANO MOUNTAINS

BERNALILLO COUNTY

TORRANCE COUNTY

SGE SwC LRD SwB Mz PR RCE LBE

14 217 222

R. 6 E. | R. 7 E. (Joins sheet 61)

T. 8 N. | T. 9 N.

1 435 000 FEET (Joins sheet 66)

500 000 FEET

53

N

2 Miles

10 000 Feet

Scale 1:24 000

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 54

54

N

2 Miles

10000 Feet

1

5000

Scale 1:24000

0 0 1000 2000 3000 4000 5000

(Joins sheet 46)

290 000 FEET

1 435 000 FEET

(Joins inset B, sheet 45)

T. 8 N.

1 420 000 FEET

265 000 FEET (Joins sheet 63)

R. 2 W. | R. 1 W.

(Joins sheet 55)

LAGUNA INDIAN RESERVATION

(ANTONIO SEDILLO GRANT)

ISLETA PUEBLO INDIAN LAND

ISLETA PUEBLO GRANT

PUERCO

RIO

BERNALILLO COUNTY

VALENCIA COUNTY

KaB TR KbB Ba Ra Ha VBB KOE PbB BCC BKD MWA MWB Bb MbC

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 54

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 55

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 55

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

295 000 FEET

1 435 000 FEET

1 420 000 FEET

320 000 FEET

(Joins sheet 47)

(Joins sheet 54)

(Joins sheet 56)

(Joins sheet 63)

ISLETA PUEBLO

GRANT

Blackbird Hill

BCC BKD Bb PbB WM MWA RBE LtB MbC AkC AmB

R. 1 W. R. 1 E.

T. 8 N.

55

N

2 Miles

10000 Feet

Scale 1:24000

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 56

56

N

Scale 1:24000

2 Miles 1 0 10000 Feet 5000 0

¾ 0 1000 2000 3000 4000 5000

(Joins sheet 48)

350 000 FEET

1 435 000 FEET

(Joins sheet 55)

1 420 000 FEET

325 000 FEET (Joins sheet 64)

(Joins sheet 57)

T. 8 N.

R. 1 E. | R. 2 E.

ISLETA PUEBLO GRANT

Wind Mesa

MWA PbB Bb RBE BCC MWB WM AmB KOE PAC

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BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 56

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 57

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 57

This map is compiled on 1972 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

355 000 FEET

1 435 000 FEET

(Joins sheet 49)

(Joins sheet 56)

(Joins inset, sheet 64)

(Joins sheet 58)

1 420 000 FEET

380 000 FEET

R. 2 E. | R. 3 E.

T. 8 N.

57

N

Scale 1:24000

2 Miles

10000 Feet

Black Mesa

Parea Mesa

ISLETA

PUEBLO

Isleta

Isleta Pueblo

RIO GRANDE

RIVERSIDE DRAIN

ALBUQUERQUE RIVERSIDE DRAIN

ATRISCO DRAIN

INDIAN DRAIN

BUTTE LATERAL

ISLETA DRAIN

ISLETA CEMETERY

SANTA FE ATCHISON TOPEKA AND SANTA FE RAILWAY

ATCHISON TOPEKA AND SANTA FE HIGHLINE CANAL

BELEN HIGHLINE CANAL

BERNALILLO COUNTY / VALENCIA COUNTY

PbB MWB WM RBE AmB AkC KR BCC BKD LtB Ah An Bs Bt Br Af Ag Gb Gc Gm Ge Gs Vc VbA Vbc TP VF

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 58

58

N

Scale 1:24000

2 Miles 1 0 10000 Feet 5000 0

¼ ¼ ¼ ¼ 1 0 1000 2000 3000 4000 5000

(Joins sheet 50)

(Joins sheet 57)

(Joins sheet 59)

410 000 FEET

1 435 000 FEET

1 420 000 FEET

385 000 FEET

ISLETA PUEBLO GRANT

BERNALILLO COUNTY
VALENCIA COUNTY

T. 8 N.

R. 3 E. | R. 4 E.

LtB WaB MWA MWB WM To PAC BKD NL

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BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 58

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 59

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

415 000 FEET

1 435 000 FEET

(Joins sheet 51)

59

N

LtB To NL WM MWA ILC RUF RLF

ISLETA PUEBLO GRANT

Cañada

Colorada

BERNALILLO COUNTY
VALENCIA COUNTY

T. 8 N.

(Joins sheet 58)

(Joins sheet 60)

1 415 000 FEET

440 000 FEET

R. 4 E. | R. 5 E.

2 Miles

10000 Feet

1 5000

Scale 1:24000

1 5000 4000 ¾ 3000 2000 ½ 1000 ¼ 0

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 60

60

N

2 Miles

10000 Feet

Scale 1:24000

(Joins sheet 52)

(Joins sheet 59)

(Joins sheet 61)

(Joins sheet 65)

470 000 FEET

1 430 000 FEET

1 415 000 FEET

445 000 FEET

ISLETA PUEBLO GRANT

ISLETA TRACT

ROF

RUF

RLF

PR

LBE

ILC

LtB

Canyon

Largo Canyon

Bonito Canyon

North Canyon

Hell Canyon

Gotera Canyon

Ra

BERNALILLO COUNTY

VALENCIA COUNTY

T. 8 N.

R. 5 E.

R. 6 E.

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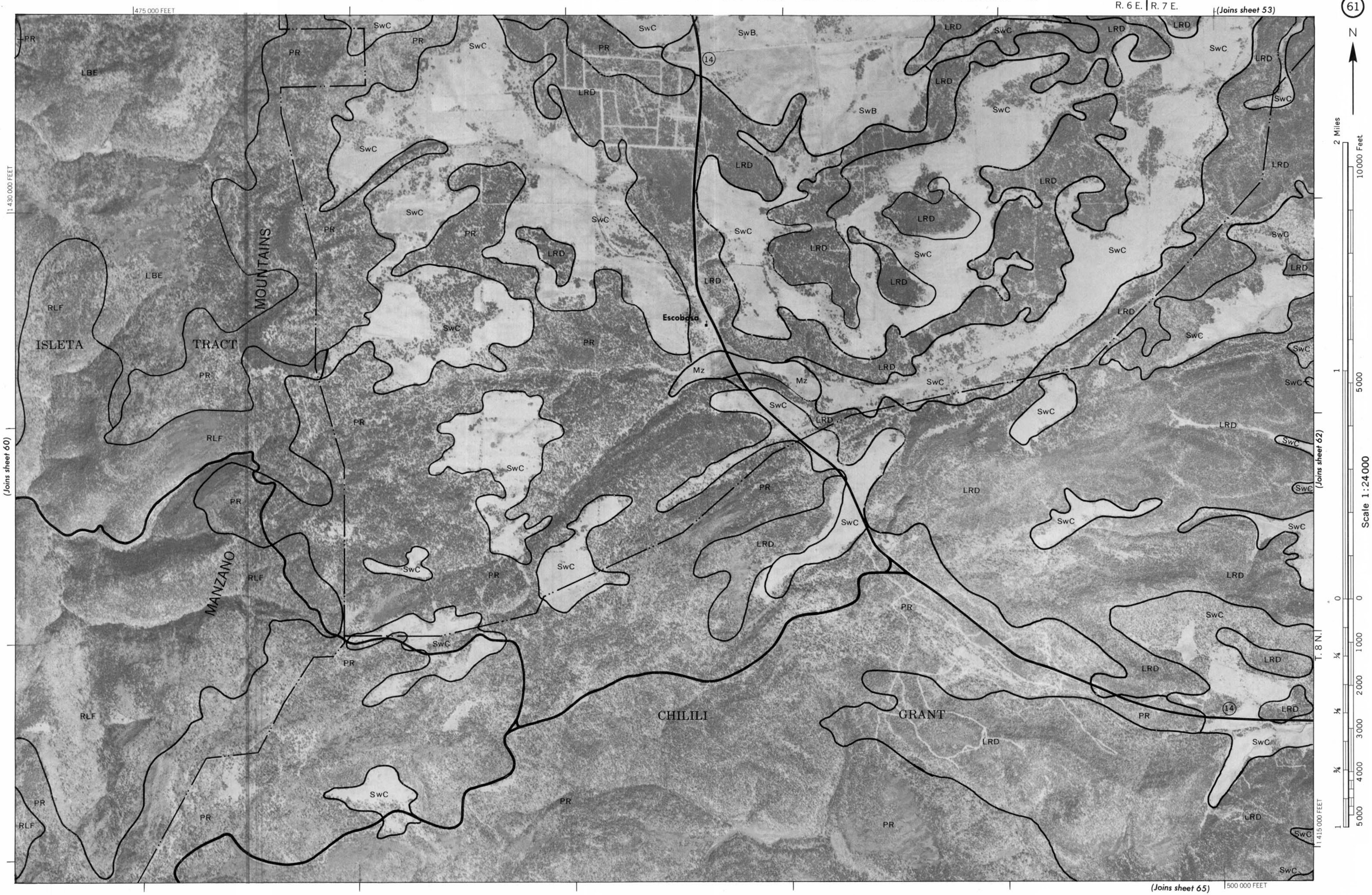
BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 60



BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 61

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 62

62

N

2 Miles

10000 Feet

Scale 1:24000

1 5000

(Joins sheet 66)

(Joins sheet 61)

530 000 FEET

1 430 000 FEET

1 415 000 FEET

505 000 FEET (Joins sheet 66)

T. 8 N.

R. 7 E.

CHILILI

GRANT

Old Chilili

Chilili

Arroyo de Chilili

COUNTY

COUNTY

BERNALILLO

TORRANCE

14

SwC

SwB

LRD

Mz

0 0 1000 2000 3000 4000 5000 FEET

¼ ½ ¾ 1

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO 62

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 63

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

63

N

R. 2 W. | R. 1 W.

265 000 FEET

290 000 FEET

1 415 000 FEET

1 410 000 FEET

T. 8 N.

(Joins sheet 54)

(Joins lower left)

ISLETA PUEBLO GRANT

PUERCO

RIO

BERNALILLO COUNTY
VALENCIA COUNTY

Ha BCC BKD Bb MbC MWA

295 000 FEET

320 000 FEET

1 415 000 FEET

1 410 000 FEET

T. 8 N.

(Joins sheet 55)

(Joins upper right)

(Joins sheet 64)

ISLETA PUEBLO GRANT

GUTIERREZ AND SEDILLO (TRACT NO 2) GRANT

BERNALILLO COUNTY
VALENCIA COUNTY

MbC AmB AkC RBE MWA LtB BKD Bb

R. 1 W. | R. 1 E.

2 Miles 1 0

10000 Feet 5000 0

Scale 1:24000

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 64

64

N

(Joins sheet 56)

R. 1 E. | R. 2 E.

350 000 FEET

1 415 000 FEET

MWA BCC AkC BKD KOE WM AmB To AmR

ISLETA PUEBLO GRANT

ATCHISON TOPEKA AND SANTA FE

BERNALILLO COUNTY
VALENCIA COUNTY

GUTIERREZ AND SEDILLO (TRACT NO 2) GRANT

(Joins sheet 63)

T. 8 N.

1 400 000 FEET

325 000 FEET

(Joins sheet 57)

365 000 FEET

Gc Gs VF TP

RIO GRANDE

HIGHLINE CANAL

RIVERSIDE DRAIN

ISLETA

BELEN HIGHWAY

25 85

(Joins upper right)

1 410 000 FEET

355 000 FEET

INSET

Scale 1:24000

2 Miles 10000 Feet

5000 0 1000 2000 3000 4000 5000

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BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 64

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 65

65

445 000 FEET

R. 5 E. | R. 6 E.

(Joins sheet 60)

1 415 000 FEET

Ra RLF RLF LBE RLF PR RLF LBE Ra LBE RLF Ra RLF PR

COUNTY
COUNTY

VALENCIA
BERNALILLO

ISLETA TRACT

CIBOLA NATIONAL FOREST

BERNALILLO
TORRANCE

COUNTY
COUNTY

T. 8 N.

(Joins lower left)

1 405 000 FEET

470 000 FEET

BRAD

475 000 FEET

(Joins sheet 61)

PR PR PR PR LRD LRD Chilili Cañon de SwC LRD PR SwC SwC PR SwC LRD

CIBOLA NATIONAL FOREST

CHILILI GRANT

BERNALILLO
TORRANCE

COUNTY
COUNTY

(Joins upper right)

1 412 000 FEET

T. 8 N.

(Joins sheet 66)

1 407 000 FEET

500 000 FEET

R. 6 E. | R. 7 E.

N

2 Miles 10 000 Feet

1 5000

Scale 1:24000

1 0 0 1 000 ¼ 2 000 ½ 3 000 ¾ 4 000 1 5 000

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 65

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BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO — SHEET NUMBER 66

66

N

(Joins sheet 62)

530 000 FEET

Cañon de Chilili

CHILILI

GRANT

BERNALILLO
TORRANCE

COUNTY
COUNTY

(Joins sheet 65)

1 410 000 FEET

T. 8 N.

TORRANCE
BERNALILLO

COUNTY
COUNTY

Marsh Ranch

(Joins sheet 53)

1 435 000 FEET

505 000 FEET (Joins sheet 62)

R. 7 E.

1 440 000 FEET

1 395 000 FEET

505 000 FEET

R. 7 E.

2 Miles

10000 Feet

Scale 1:24000

5000 0 1000 2000 3000 4000 5000

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Coordinate grid ticks and land division corners, if shown, are approximately postioned.

BERNALILLO CO., & PARTS OF SANDOVAL & VALENCIA COUNTIES, NEW MEXICO NO. 66